SCIENTIFIC AMERICAN

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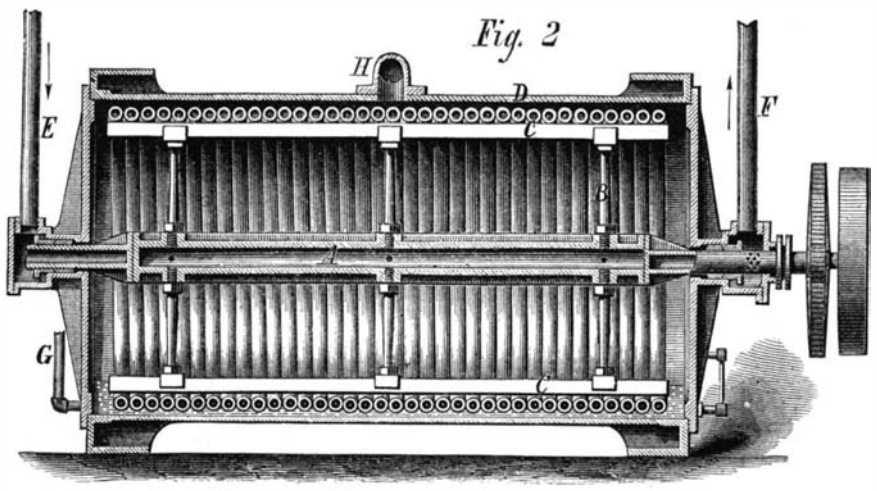
IMPROVED ICE MACHINE.

This ice machine is constructed upon the general principle of the employment of a non-congealable liquid as a vehicle for conveying the cold product to a receptacle where the temperature of the cooled liquid is transmitted to atmospheric air, which is then later directed into a congealing receptacle, where the freezing effect is produced,

A perspective view of the apparatus is shown in Fig. 1. In Fig. 2 is shown the refrigerating cylinder in section, a perspective view of the same being seen at the right of the view, Fig. 1. This refrigerator cylinder may be made of any suitable material and covered with felt or some non-conducting material. It is journaled on a longitudinal shaft, A, which is provided with radial arms, B, which carry upon their outer ends longitudinally arranged ribs, C. Around these ribs, and near the inner periphery of the cylinder, is wound a continuous coiled pipe, D, in which circulates strongly saturated brine or other non-congealable liquid, which is received from a convenient cistern or tank. A coil of pipe extends the entire length of the cylinder, and at each end communicates with the hollow ends of the shaft, A, and through this hollow with the supply pipe, E, and the exit pipe, F, so that a continuous circulation of the non-congealable liquid may be kept up in the coil. Inside of this cylinder a volatile liquid is placed, which may be ether, gasoline, ammonia, bisulphide of carbon, or other easily evaporated liquid, which is introduced through a pipe, G, and is maintained at such level as to immerse the bottom portion of the coil of pipes, which level may be regulated by means of a glass gauge upon the outside. As the coil of pipes is revolved by any suitable mechanism, the coil passes to the upper portion of the cylinder with its surface moistened by the volatile liquid, which it carries up from adhesive attraction; and as the cylinder is exhausted of its gaseous contents through the pipe, H, by means of the pumps seen at the left of the cut, Fig. 1, the evaporation of the liquid upon the surface of the coil rapidly takes place to supply the partial vacuum, and a corresponding reduction of the temperature of the pipes and its contained vehicle of non-congealable liquid takes place.

Fig. 2



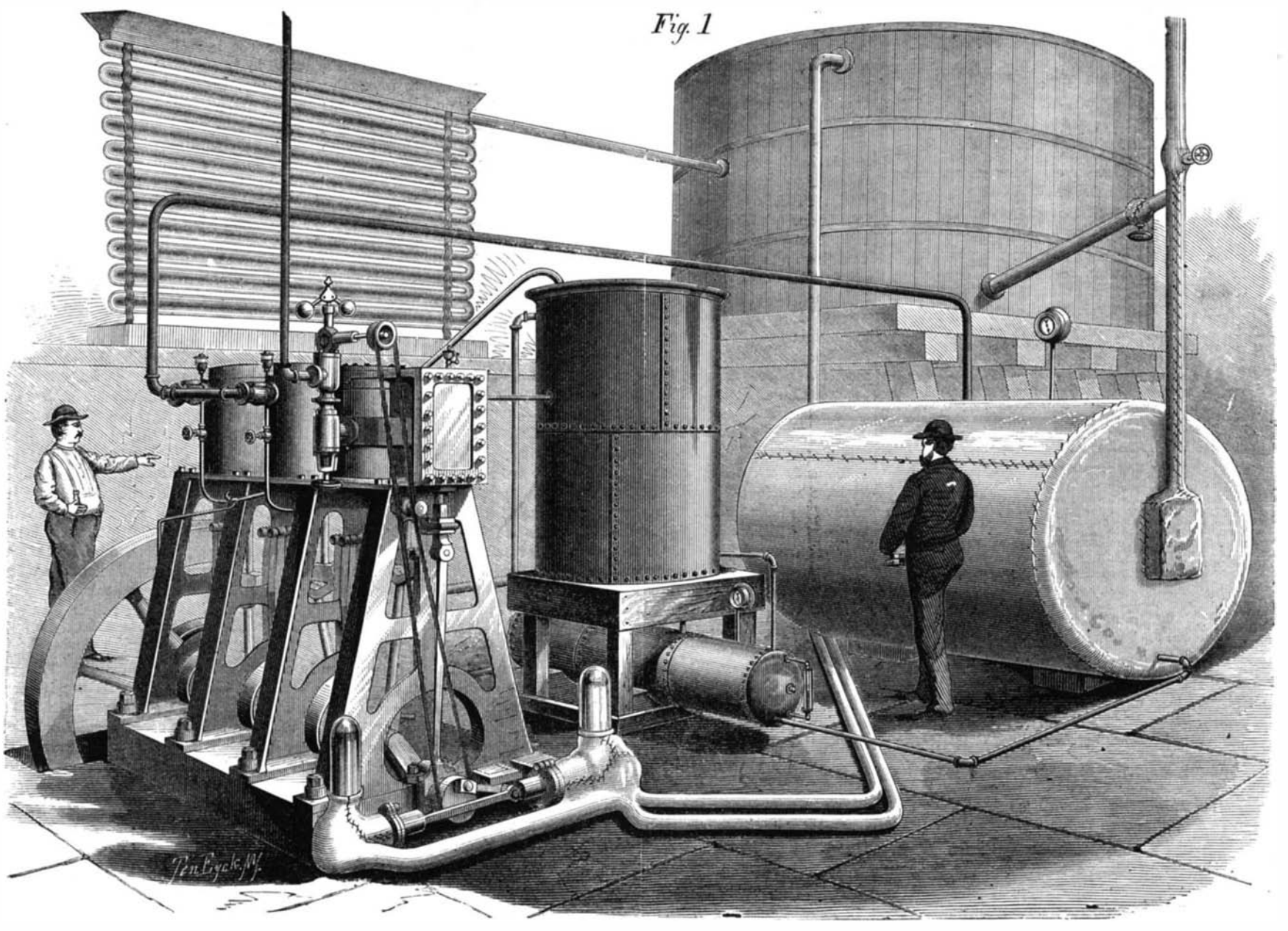
To guard against leakage, which would prevent the best action of the pump in effecting evaporation, the ends of the shaft, A, are provided with stuffing boxes, while the outer parts of the bearings are enlarged to form water boxes, which are filled with the non-congealable liquid, and these, together with the stuffing boxes, effectually seal the bearings against all leakage of air in the interior.

As the gas is exhausted from the cylinder, it passes to the pumps previously referred to, from thence to a condenser, seen in the center of Fig. 1, and thence through a pipe as liquid to a receiver which is shown underneath the condenser. The cooled non-congealable liquid passes into the case, M, Fig. 4, through the pipe, F, and from thence back to the coil in the cylinder through the pipe, E. The circulating of liquid is effected through a circulating pump, shown at the foot and just at the right of the pump previously spoken of, which is operated by the engine at the right of the pumps, which also works the large pumps, refrigerator coil, and a rotary blower for circulating air in the congealing case.

The large pumps, of which there are two (for detail see Fig. 3), form an important part of the apparatus. They communicate with pipe, H, from the cylinder through inwardly opening check valves, I, located in the branches of the pipe. These pumps are also provided with a gravity cup-shaped valve, J, which is of greater diameter than the piston cylinder, and plays between the cylinder head and the flange of the body of the cylinder, upon which it is seated, being guided in its movement by ribs in the enlarged cavity of the cylinder-head. In operation, upon the descent of the piston the gas is drawn through the pipe, H, the check valves, I, are opened, and the pump cylinder filled. But when piston rises the check valves are closed, and the compressed gases above the pis-

[*Continued on page* 98.]

Fig. 1



HOLDEN'S IMPROVED ICE MACHINE.

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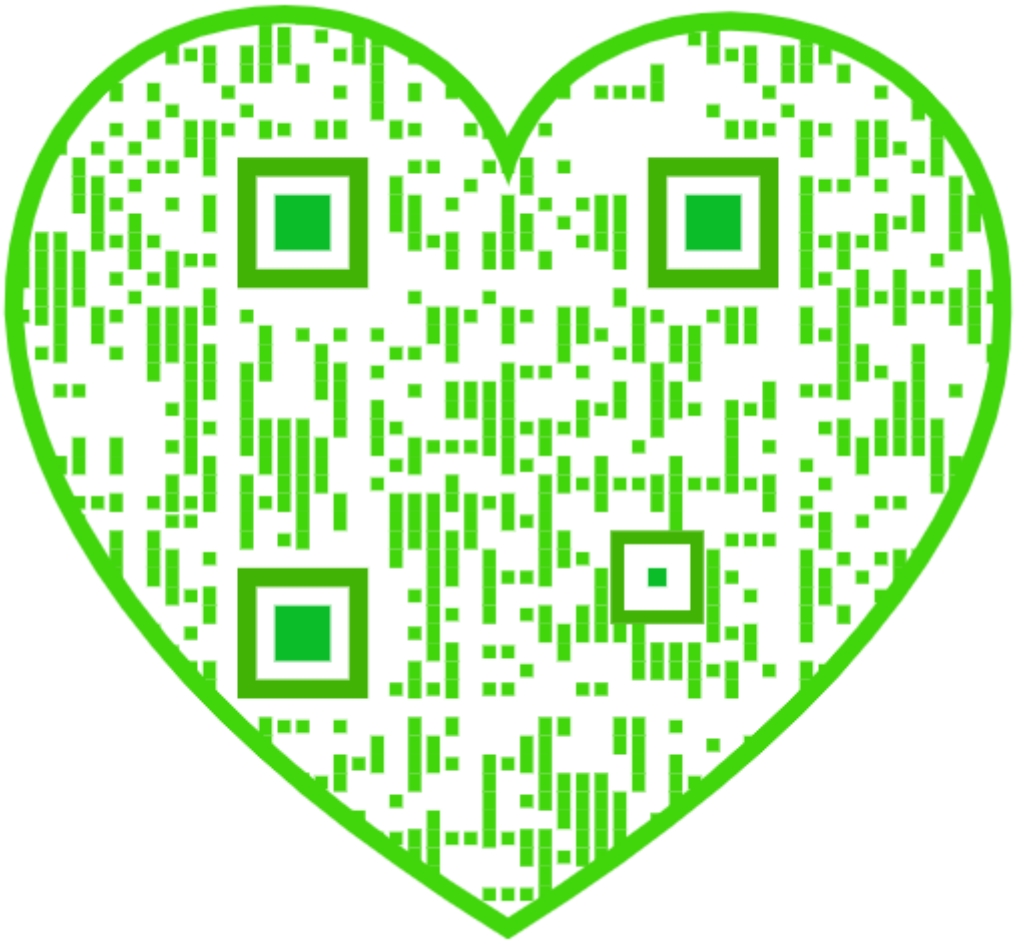

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NEW YORK, SATURDAY, AUGUST 18, 1877.

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V. ASTRONOMY.—Dr. Dobercks recent Catalogue of thirteen Double revolving Stars.—Physical Observations of the planet Mars.—Mars in the Autumn of 1877. By RICHARD A. PROCTOR, F.R.S. With Chart of her lands and waters of the planet and 6 illustrations of her telescopic appearance in opposition.

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POISON IVY AND ITS REMEDIES.

A correspondent asks: "Can you inform me by what characteristics I can determine the poisonous species of dogwood and ivy, and what simple remedy there is for their effect on the skin?"

Poisonous dogwood is a name improperly given in some parts of the United States to the rhus venenata, a species of poisonous sumach. It is sometimes called poison elder. It is a neat, graceful shrub growing from 6 to 18 feet high, and is found in swamps from Canada to Louisiana. The young shoots are purple or green clouded with purple, and marked by orange-colored dots which turn grayish; the leaves have 7 to 13 leaflets, which are dark green, pointed and entire on the margins; the greenish yellow flowers are in loose axillary panicles, and the greenish white fruit hangs in loose clusters on stems 6 to 8 inches long, and remains after the leaves have fallen; the juice is milky, and dries to a black varnish. This has poisonous qualities which are virulent. Its effect is an acute eczematous inflammation of the skin, often accompanied with much swelling.

The poison ivy or poison oak, in some places called mercury vine, the toxicodendron group of the botanists, includes two species with white or dun-colored berries in loose panicles and highly poisonous foilage. It has leaves of 3 leaflets, which are rhombic ovate, and variously notched, lobed, or even entire; its flowers are in loose slender axillary panicles; the smooth fruit is pale brown. It is found nearly all over the country, and especially in moist and shady places, and presents two forms, one erect and the other climbing. It clambers over rocks and fences, and by means of aerial rootlets ascends the trunks of the tallest trees, and adheres with great pertinacity. When wounded it exudes a milky juice, which becomes black on exposure to the air, and upon fabrics makes a stain indelible by all ordinary solvents. The leaves taken internally promote the secretions of the skin and kidneys. This plant is highly poisonous to some persons. Many can handle these plants without any unpleasant results, while others are seriously affected by touching them or even passing near them. The poisonous properties are due to a volatile acid, which has been called toxicodendric.

Many remedies are employed for poisoning by these plants, some of which will have beneficial effect on some persons, while on others have no effect at all. Water saturated with salt will often prove a cure, and at other times have no effect. The same may be said of sweet oil. There has been a remedy employed in some of the New England States that has been claimed to be effectual. It was this, the fat of the common black snake (*bascanion constrictor*) rendered into oil and applied to the parts affected. A strong lye made from wood ashes has been beneficially used, and so has an application of iodide of potassium. Another remedy is to take the fresh bark of the witchhazel (*Virginian hamamelis*), boil and apply the liquor as hot as the patients can bear it. A decoction made of the rattlesnake weed (*hieracium venosum*) applied to the parts afflicted will in most instances afford relief. Another remedy is to take one pint of the bark of the spotted alder, add one quart of water, and boil down to one pint; wash the parts poisoned several times a day. This remedy is said not to be injurious. Another remedy is to take the leaves of the poisonous nightshade (*belladonna*), boil them in milk to a poultice, bind it on the poisoned parts, and renew as often as it gets dry. A solution of belladonna, say a teaspoonful to a tumbler of water, with which bathe the parts freely. This has been used with signal success. Extract of lobelia or a poultice made from the fresh leaves may be used, but the external use of the plant in excess may produce vomiting and symptoms of poisoning. It ought to be applied under the advice of a physician. Another remedy is to bathe parts with spirits of niter. If the blisters are broken, so as to allow the niter to penetrate the cuticle, a simple application may effect a cure. Apply several times daily. Another remedy is to take three or four drops of the medicinal remedy known as rhus toxicodendron, drink two or three times daily in half a glass of water.

A NEW THEORY OF THE SOLAR SPECTRUM.

Since the invention of the spectroscope, and its application to the study of the solar spectrum, the dark lines in the latter have been considered as absorption bands, caused by a layer of ignited metallic vapors, which surrounded the photosphere of the sun and changed the luminous and continuous spectrum of the photosphere into one covered with a multitude of dark lines, corresponding with the bright lines which we can produce by the combustion of various metallic substances.

Professor Henry Draper now comes forward with a series of experiments and deductions from the same, and proves that we must change this theory and form another conception, namely, that the solar spectrum consists also of bright lines and bands superposed on a less luminous background of continuous spectrum. Such a conception, combined with observations in regard to these bright lines, opens the way to the discovery of metalloids, sulphur, phosphorus, selenium, chlorine, bromine, iodine, fluorine, carbon, etc., the lines of which thus far have not been discovered in the solar spectrum. At the same time many of the dark lines, not thus far accounted for, may be due to being merely intervals between very bright lines.

That an incandescent gas in the solar atmosphere should *not always* be subject to the law, that it absorbs rays of the same refrangibility as it emits, may, at first sight, be difficult to understand. But the fact is, the substances thus far investigated in the sun have been metallic vapors, to which, according to our present knowledge of chemistry, hydrogen also belongs. The metalloids may, and probably do, behave differently; the intensity of the light, from a great thickness of incandescent hydrogen, overpowers the effect of the photosphere; and instead of throwing a shadow of the rays of the same refrangibility, it increases the luminosity. It is as if a person looked through a yard thickness of ignited sodium vapor to a candle flame; he would see no dark sodium light, but a bright one; while looking at a very bright flame, he would see the comparatively dark sodium lines.

This would necessitate the supposition that some incandescent gases could give out more light than other substances in the sun, and why not? Has not Huggins shown that, in the outburst of the star τ *Coronæ Borealis*, hydrogen could give bright lines on a bright background of a similar nature to the background of the solar spectrum?

It is evident that bright lines on a less bright background make to ocular observations not so much impression upon the mind as the dark lines, and this is the simple reason that thus far they have been overlooked. If, however, the solar spectrum is photographed, such lines become very prominent; and the photograph being a permanent record, they may be easily compared with bright lines photographed from other spectra, such as those of air, oxygen, nitrogen, carbonic acid, etc., illuminated by means of the electric spark.

This is what Professor Henry Draper has been doing, and we call attention to the following article containing an account of the manner in which he demonstrated the presence of oxygen in the solar photosphere.

Frauenhofer who, about one century ago, first discovered the dark lines of the spectrum, which at the present day are named after him, also discovered that these lines are different when the light of some of the prominent fixed stars is investigated; and Berzelius, in remarking this, said in the beginning of this century that the study of these lines would at some future day lead us to the knowledge of the cause of the development of light in the heavenly bodies. This was a genuine prophecy, of which the world now begins to see the realization.

DISCOVERY OF OXYGEN IN THE SUN BY PHOTOGRAPHY.

Professor Henry Draper has announced the discovery of a series of bright lines or bands in the photograph of the solar spectrum, which correspond exactly with the principal bright lines or bands seen in photographs obtained by means of electric illumination in the spectrum of oxygen.

He has, in the *American Journal of Science and Arts*, published a paper and illustrated it with a photograph, in which he shows the perfect coincidence of certain bright lines. The photograph contains in its upper half the solar spectrum, and in its lower half the spectrum of air obtained by passing the spark of a Gramme induction machine (driven by Brayton's petroleum motor) from an iron to an aluminum point. The coincidence of the luminous oxygen and even of the nitrogen lines is really remarkable; and as the photograph is stated to be absolutely free from hand work or retouching, it places the subject in question beyond doubt. Thus the iron and aluminum lines, produced by the effect of the powerful electric current upon the electrodes, show themselves, and the first may be traced in the solar spectrum at the corresponding places, as might be expected.

We will only add that Professor Draper has made detailed comparison of these lines in the spectra of air, oxygen, nitrogen, hydrogen, carbonic acid, carburetted hydrogen, and cyanogen, so as to be sure of the luminous lines belonging to oxygen, and he has also made experiments with these gases at various pressures, as in some of them the lines vary with the pressure. It may be remarked as an important fact that the spectrum of oxygen is not subject to variation, but that its lines are constant at all pressures.

Science is already largely indebted to Professor Draper for the originality of his researches, and no doubt important results may be expected in the train of research he is now following. It is useless to speculate as yet on the nature of the sun, and it is better left to later times, when our knowledge of this remarkable body will be more complete; but one thing is certain, that the idea of Herschel that the sun may be an inhabited globe must be given up. It is undoubtedly a body at a temperature so high that the substances present there are dissociated and cannot enter into chemical combinations. However, that we will find there all the elements present on our globe may be anticipated if we adopt the theory of Kant and Laplace of a common origin of our whole planetary system out of one single nebula.

AN ELECTRIC FIRE.

A fire recently occurred at the Western Union Telegraph Office, in New York city, that was one of those incidental circumstances in the operation of a great enterprise that imparts a lesson of experience. The cause was defective insulation of wires that came in contact, in what is known as the "grand switch." This switch is situated in an upper story, and consists of a mahogany table about 25 feet long and 5 broad. It is of elegant cabinet work, placed vertically, and contains about 400 wires, which pass from the battery room through apertures in the ceiling into the switch. It also controls about 10,000 connections. It is, in fact, a systematized combination of all the wires issuing from the chief office to every part of the country.

These wires as they enter the switch are separated and insulated. By some means two of the wires, not sufficiently insulated, came in contact with each other. Electrical heat

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was generated, which soon set the wood of the switch on fire. When discovered the conflagration could not have been continued over ten minutes, yet the time was sufficient to seriously damage the elegant woodwork, warp and twist the multitude of wires into every conceivable shape, and render them inoperative and worthless for future use.

The actual loss to the building will not exceed $700, but the fire caused a temporary cessation of business of the department, which, together with the loss of wires, switch, and the extra labor entailed, it is claimed, will make the loss to the company about $20,000.

SUNSHINE IN LONDON AND NEW YORK.

At the Royal Observatory, Greenwich, Eng., a self-registering sun dial is used to indicate and record the daily duration of sunshine. The instrument consists of a lens made in the form of a ball, of glass, 4 inches in diameter, supported concentrically with a metallic bowl. The focus of the ball lens falls on the concave surface of the bowl, in which is placed a strip of suitable combustible material; the arrangement being such that, when the sun shines, the material is charred and a burned line is made, the length and position of which indicates the time and the duration of the solar radiance. Some very curious results are given, which illustrate in a striking manner the difference between the atmospheric conditions of London and New York, especially in the fall and winter months.

During the entire year ending April, 1877, there were, according to this register, only 1,200 hours of sunshine at Greenwich, or an average of a trifle over 3¼ hours per diem. The monthly record was as follows:

May.....	152·3	Sept.....	106·1	Jan.....	18·7
June.....	184·5	Oct.....	47·3	Feb.....	36·4
July.....	214·3	Nov.....	35.9	Mar.....	99·3
Aug.....	216·9	Dec.....	6·5	Apr.....	71·8

We have not at hand any reliable register of sunshine in New York like the above; but it is within the experience of every one living here that our periods of sunshine far surpass those of London. For example, London makes the beggarly show of only six and a half hours of sun during the entire month of December. In New York, we have in December many days of solar brilliancy, any one of which would register more hours of sunshine than the Londoners get during the whole month.

We hope that some one will introduce the globe lens here and ascertain the exact sunny records for this latitude. The instrument would form a useful addition to the meteorological observatory of the Central Park.

DIMNESS OF THE EYES.

Dr. George C. Harlan, of Philadelphia, Pa., has lately communicated to the Medical Society, of that city, some very interesting observations concerning that insidious and often incurable disease, albuminuria. The presence of the disease, in cases previously unsuspected, he has discovered by examination of the patient's eyes by means of the ophthalmoscope. In one instance, a gentleman, 35 years of age, a picture of health, with appetite and digestion good, complained of a dimness in the sight of the left eye, which rapidly increased, and then the right eye became similarly affected. Examination of the eyes with the instrument showed well marked *retinitis albuminurica*. Further medical examinations revealed the presence of the hyaline casts, and the fact that the patient had reached the last stages of albuminurious disease. Two and a half months later he died. Dr. Harlan cites quite a number of other cases of persons who considered themselves in perfect health, but in whose eyes the impress of the terrible disease was discovered, and who quickly succumbed to its power. It remains for the students of medical science to discover some means whereby the early approach of the disease can be detected and proper remedies applied in time to effect a cure.

Professor Isaac W. Jackson.

Professor Isaac W. Jackson died on the 28th ult. in Schenectady, N. Y., in the 73d year of his age. For 51 years he was a professor in Union College. He was born at Cornwall, Orange county, N. Y., in 1805. In 1824 he was graduated at the Albany Academy with the highest honors. Two years later he was graduated at Union College, where he has ever since remained as tutor and professor. As a student, an author, and an instructor in mathematics, he gave evidence of the singleness of purpose with which he took up his life work. His works and text books on conic sections, optics, mechanics and trigonometry, have received the cordial appreciation of competent critics, and have stood the severer test of use in the class room both at home and in foreign lands. In the development of the art of landscape gardening and the improvement of horticulture, he was peculiarly fortunate. The College garden owed its existence to his wise forethought and prudent management. Through his famous garden he contributed largely during many years to the introduction and distribution of the choicest fruits and flowers. Professor Jackson's life was a noble, self-sacrificing one. He devoted himself earnestly to the education and improvement of the youths under his charge.

CLEOPATRA'S NEEDLE.—In preparing to move the obelisk at Alexandria, two inscriptions have been found upon it—one in Latin, the other in Greek. They fix as the year of its erection at Alexandria, by Barbarus, prefect of Egypt, the eighth year of Augustus Cæsar's reign; or about 32 years before the birth of Christ. Fontius, the engineer, did it.

Odors of the Human Body.

At a recent meeting of the American Neurological Association, Dr. Hammond called attention to some facts in regard to the natural odor of the body in the human species, and of the faculty which some of the lower animals possessed,—that of differentiating between the odors of different individuals. Besides the inherent odor of the body, there was reason for believing that an entirely different one may be given off, not only as a consequence of disease, but as a result of emotional disturbance. During the middle ages, manifestations of the kind in question were not uncommon in the persons of both sexes, and were attributed to miraculous power. That such cases existed was probable, not, however, as a special gift of God, but as a neurosis similar to other instances which had come under the doctor's own observation. Cases were then cited, of a number of the more important instances among the saints, who were considered highly odoriferous. So far as the author of the paper was aware, there had been no attention given to the subject in the relations now under notice. The cases cited by Dr. Hammond as bearing upon this point were briefly as follows:

A young married lady of strong hysterical tendencies, from whom, during a paroxysm, an agreeable odor, similar to that of violets, was exhaled only from the left lateral half of the anterior wall of the chest. At such times the perspiration was remarkably increased in this region, as compared with the corresponding part opposite. The odor was perceptible at a distance of several feet, but was entirely absent during the intervals of the paroxysms. From an examination of an alcoholic extract of the odoriferous perspiration exhaled by this patient, it was presumed that the odor was due to the presence of butyric ether. The local application of several remedies to the parts, among which were preparations of carbolic acid, soap and water, and other alkaline substances, gave the patient only temporary relief from the odor; but the internal administration of the salicylate of soda, in doses of five grains, entirely cured this lady of her violaceous odor, and the perspiration of the region was reduced to the normal character.

A second case was that of a young lady in whom the first exhibition of the odor (in this case that of pine apple) occurred contemporaneously with an attack of chorea.

In a third case a pine-apple odor was emitted from the skin of the head, neck, and chest of a woman whenever she was angry.

A fourth case was that of a man who, during frequent hypochondriacal periods, emitted a violaceous odor. Occasionally cases were met with from whom a disagreeable odor was exhaled during sexual excitement. No opinion as to the actual and immediate cause of these odorous emanations was expressed, further than that they were due to a nervous disturbance.

Dr. Hammond passed around a small vial containing an alcoholic extract of the odoriferous perspiration of his first patient, which had a distinct violet smell; also a second vial of the same extract, with the addition of bicarbonate of soda, smelling strongly of pine-apple.

The paper was discussed by Drs. Jewell, Beard, Hammond, Seguin, Hamilton, and Spitzka, cases of a similar nature to those mentioned in Dr. Hammond's paper being cited.

Combination Wood and Iron Pavement.

By permission of the Commissioners of Sewers of the City of London, a portion of the new wood paving in Beech street has been charged with iron (3 cwt. to the square yard) by way of experiment. The object is to increase the durability of wood and preserve and protect it from heavy racking traffic, and to test the practicability of securing small blocks of iron without framework, and so as to deaden the noise and counteract the other disadvantage of metal, as hitherto applied. The ordinary wood paving blocks are beveled by machinery on the upper and lower edges, and between each row is laid a row of cast iron blocks of double wedged section, thicker at the upper and lower surfaces than in the center, so as to fit mechanically between the bevelled wood blocks, which on section are thicker in the center than at the upper and lower surfaces. The iron blocks weigh 16 lbs. each, are rounded and serrated on surface for foothold, and perforated for grouting material, and are bedded in sand on the ordinary concrete bed.

Hints for Home Builders.

First, let your cellars be large, well ventilated, and lined with stone or cemented above the level of the ground. The breath of life in furnace-heated houses depends literally on the air of the cellar, unless there be a flue for fresh air extending from the furnace out-of-doors (never the case in cheap, showy houses). The air of the whole house is sucked through this narrow and often unclean apartment, the care of which is usually intrusted to ignorant servants. We have spoken in a previous number of the malaria engendered by massing quantities of vegetables in the cellars, as is the practice in farmhouses during the winter. The lining of stone or cement not only prevents dampness, but is absolutely necessary in streets through which the sewers pass, as a protection from rats. Terriers, ferrets, traps, or poison are feeble defences against the legions which swarm in nightly from a neighboring culvert. Next to the cellars comes the kitchen, which should be large, airy, and sunny. To take no higher ground, conveniences in this department are a politic investment which pay a full interest of capital, especially to the housekeeper who does not live in a large city. Stationary tubs, closets beneath the dressers for flour, dry groceries, spices, etc., will be likely to tempt into her household a better class of servants, and, when she is forced to turn cook and baker herself, will take half the burden from her weary hands. An addition to comfort, much neglected by builders, is the lighting of stairways, closets, pantries. We have in our mind's eye a modest little house, in a closely built neighborhood of dark buildings, which gives you a sunny, cheerful welcome in every corner: a result produced not only by windows wherever a window is practicable, but by a sky-light of plate glass which sends down sunshine through three floors of closets, halls, and pantries. A mistake made also, which resolves itself into a question of humanity, is the placing the servants' chambers on the top of the house, be that three or seven stories above the kitchen. Passing along a city street at night one cannot look up at the dim lights burning in these far skyey attics without a groan of compassion for the wearied wretches dragging themselves to their beds up yonder after the day's hard labor.—*Scribner.*

To Detect Bad Water.

For detection of animal decomposition products in water, a watery extract of gall nuts was used by M. Fauré. It has also been recommended to use tannic acid for improvement of bad drinking water. M. Kämmeren has recently advised the use of tannin for discovering putrefying animal products in water. He considers that the presence of gelatin in ground water can no longer be doubted, and it is often found in comparatively large quantities. The presence of salt and other compounds in water may delay the precipitation by tannin; hence the purity of water should not be affirmed, as regards tannin reaction, till after 24 hours of this. Every water which becomes troubled in a considerable degree through tannin must be held dangerous as drinking water. For this judgment it is all the same whether a precipitate occurs at once or only after a long time; for the time depends less on the nature of the precipitated body than on the dissolved substances which retard precipitation.

American Institute Exhibition.

Applications for space should be forwarded at once to the General Superintendent, room 22, Cooper Union building, New York, and all details arranged through him with as little delay as possible. Persons familiar with the exhibitions annually given by this Institute are aware that one of the great troubles with which the exhibitor has to contend is that of sufficient space; as all applications which comply with the rules are considered in the order of their coming, it is therefore evident that better location is secured by the early than by the late applicant. The Exhibition will open on the 12th day of September.

Pigeon vs. Locomotive.

A race between a carrier pigeon and a mail train recently took place from Dover to London. The pigeon was of the Belgian breed, and was "homed" to a house in Cannon street. On the train leaving Dover it was thrown from a carriage, and was observed to circle round for a few moments, when it took its flight in a line between Sittingbourne and Maidstone, which would, of course, be the nearest route to London. Although the railway people were confident in the powers of their locomotive (the Continental express) the bird arrived twenty minutes before the train. The times are not given, but the pigeon must have flown at the rate of fifty miles an hour.

Spontaneous Combustion of Zinc Dust.

Zinc dust, so called, is a fine, grayish powder, used extensively in dye works, and consists of 40 per cent zinc, 2½ per cent lead, 4 per cent cadmium, 50 per cent oxide of zinc, 3½ per cent carbonate of zinc, and some non-metallic dust. Such zinc dust becomes spontaneously incandescent at the presence of moisture, and has been known, says *Dingler's Journal*, to cause conflagration on shipboard.

Davyum—A New Metal.

Another new metal has been discovered. M. Sergius Kern, of St. Petersburg, has found in platinum "ores" a new metal which appears to occupy a place midway between molybdenum and ruthenium. He is studying its physical and chemical properties, and proposes to call it Davyum, in honor of Sir Humphrey Davy. Platinum is found in the metallic state in alluvial deposits; but is rarely, if ever, pure, being generally alloyed with iron, palladium, osmium, iridium, and copper.

Solubility of Sulphur in Acetic Acid.

Liebermann draws attention to the fact that sulphur is soluble to a not inconsiderable degree in warm concentrated acetic acid, while a trace is taken up even by the dilute acid. If the concentrated solvent be diluted with water, much of the sulphur separates as "milk of sulphur;" if it be concentrated with the Bunsen pump, fine long prisms of sulphur separate; when cooled, the liquid deposits sulphur in a crystalline form. All modifications of this element appear to be taken up by acetic acid. The author points to cases in analysis where these changes occur, and are apt to mislead the operator.—*Wiener Anz.*

SILVER was first coined by Phidon, King of Argos, about about 860 B. C., the epoch of the building of Carthage, and about 140 years after the construction of Solomon's Temple.

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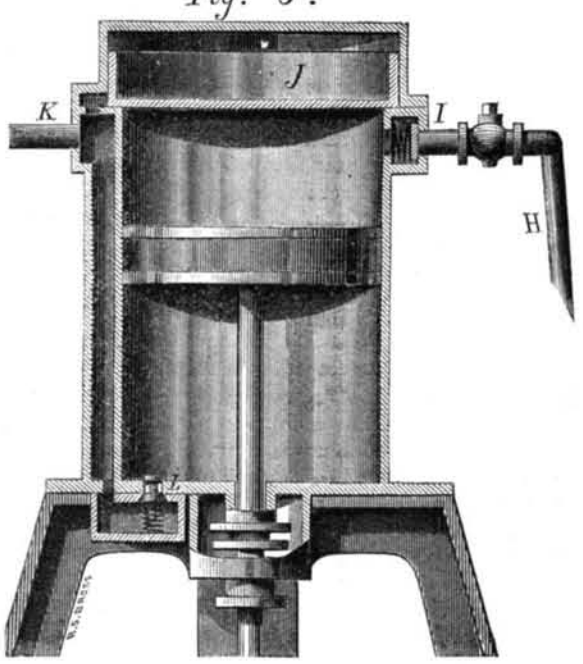
[*Continued from first page.*]

ton lift the valve, J, and allow the gas to pass out into the pipe and from thence to the condenser through K. As, however, the gases contained in the portion of the pipe between the pump cylinder and the check are compressed, but not forced out, if the piston should descend with this press-

Fig. 3.



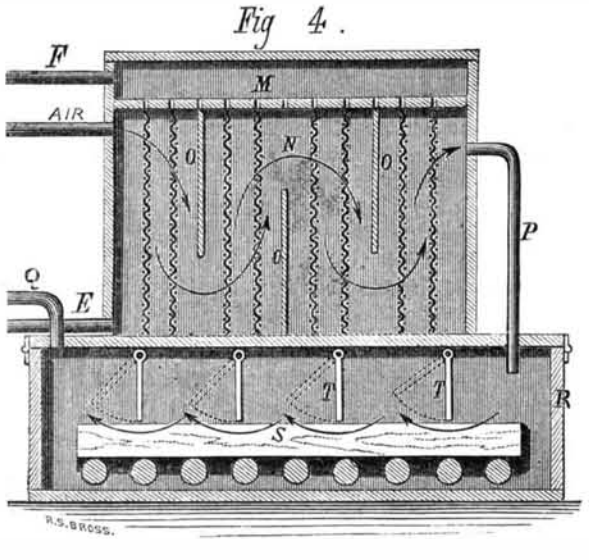
ure of gas retained here, it is obvious that the gas would expand, and, by partially filling the chamber, prevent the perfect exhaustion of the gas cylinder. To provide for this, the piston in its upward stroke passes the orifices of pipe, H, so that the compressed charge of gas is held in the confined space and is liberated beneath the piston, and upon its descent is driven out through the valve, L, at the bottom into a pipe that communicates with K. It will be observed that the face of the piston, in rising, strikes against the bottom of the cup valve and lifts it, and upon the reverse stroke the valve seats itself upon the flange of the cylinder, while the plain ground face of the piston departs from the plain ground bottom of the valve it produces as nearly a perfect vacuum as possible to attain in a pump, there being practically no cushion of gas left between the valve and piston.

As the gas is delivered to the condenser it is made to traverse coils and is cooled by the circulation of water of the normal temperature which passes through the condenser. As the gas is liquefied it passes into the receiver, where it accumulates and is fed from time to time back into the refrigerator cylinder.

As the non-congealable liquid in the coil of the refrigertor circulates, it passes out through the pipe, F, to the distribulating pan, M, Fig. 4, where its temperature is to be transferred to the air circulating in the subjacent case, N. The upper case is provided with a distributing pan, into which the cooled liquid is admitted. The bottom of the pan has perforations which are arranged in rows immediately above a series of vertical partitions of wire gauze, between which are arranged the vertical baffle plates.

As the cooled liquid drops through the perforations in the pan, it falls upon the wire partitions, and being retarded in its descent, trickles slowly down, while the current of air driven through the case by the blower is made to pass through and penetrate all parts by reason of the baffle plates, and in so doing takes on the temperature of the non-congealable liquid, which is below the freezing point of water,

Fig 4.



and passes into the congealing case at and through pipe, P, and then traverses the pans in the congealing case to freeze the water therein contained, and after having done its duty passes up through the blower and pipe, Q, to be reduced in temperature again.

The congealing case has doors, R R, at each end, and is provided with supporting rollers upon which the pans, S, are fed in at one end and removed at the other.

The apparatus may be made applicable to cooling liquids, as beer, etc. When applied to such purpose, the liquid is allowed to trickle down over the coiled pipes seen at the left of Fig. 1. In a large brewery, where a contract required 560 barrels of water to be cooled from 60° to 38° Fah. in 24 hours, which is equal to the production of 8½ tons of ice from water at 80°, the actual yield of this machine consisted in the cooling of 1,010 barrels of water, which is equal to the production of 16 tons of ice per diem. For this yield the machine required an average of 24 horse power. The apparatus, as shown in Fig. 1, was taken from one in actual use in a large brewery in Philadelphia. It requires but the attention of a single attendant.

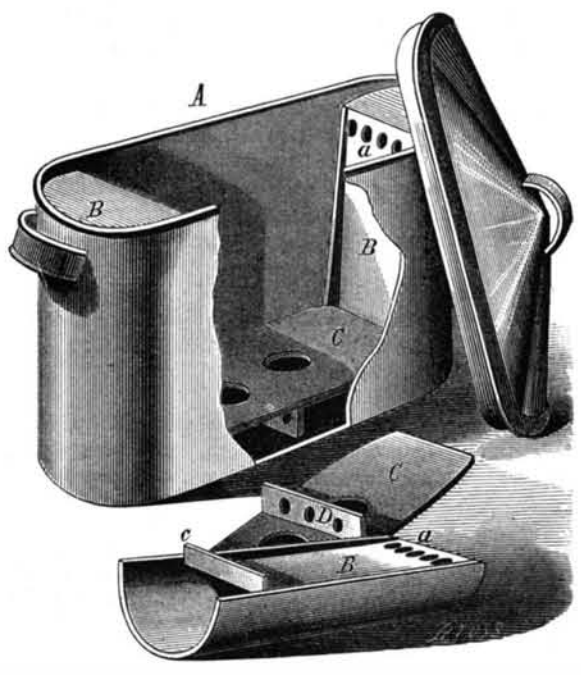
This improved ice machine was patented through the Scientific American Patent Agency, January 31, 1877, by Major D. L. Holden. The pump was patented March 6, 1877. For further information, address D. L. Holden & Bro., Beach and Palmer Sts., Philadelphia, Pa.

Conjunction of Mars and Saturn.

At the last meeting of the London Astronomical Society, Professor Marth exhibited some diagrams of the triple conjunction of Mars and Saturn, between July and November of this year. The dates of the three conjunctions are: July 27, 5:15 P.M.; August 26, 4:19 A.M., and November 4, 12:8 A.M., all New York time. The last of these occurences will be the most interesting, from the remarkably close approach of the two planets, the distance between them being only eleven minutes of arc, or about one third the diameter of the moon. Saturn, the greater Infortune, and Mars, the lesser Infortune, of the old astrological systems, may now be found in the southeast before midnight. Mars is daily increasing in brightness, and in the last days of August and the opening days of September will be much more brilliant than he has been since 1845, or will be again till 1924.

IMPROVED WASHBOILER.

This invention relates to that class of washboilers which are constructed with a false bottom, and have passages or conduits leading to the top of the boiler, through which the water, when heated, escapes from below the false bottom.



The form of the boiler, as shown in the cut, is of the usual construction. The two conduits, B B, are made with a straight front piece and with a rounded back piece, which fits into the curvature of the boiler. These conduits are provided with holes, *a*, at the top, and are made with a projecting shoulder or bracket, *c*, at the bottom. A false bottom, C, has a perforated brace or cross piece, D, at its inner side, and is provided with openings for the ingress of the water under the false bottom. The ends of this button, C, are cut off straight, so as to rest on the brackets, *c*.

When it is desired to use the boiler for washing purposes, the conduits are inserted, after which the false bottom is put in position. Upon this bottom the clothes are placed, after being soaped, in layers, abutting against the conduits at each side, and a quantity of water is put in the boiler, which is then placed over the fire. The heated water and steam will be forced up through the conduits, and, escaping through the openings in a continuous stream, is poured with considerable force down upon the clothes, where it mingles with the soap. This flow is constant and uninterrupted as long as the boiler is kept upon the fire.

This improved washboiler was patented June 5, 1857, by Thomas Gunsalus, West Troy, N. Y., to whom apply for further particulars.

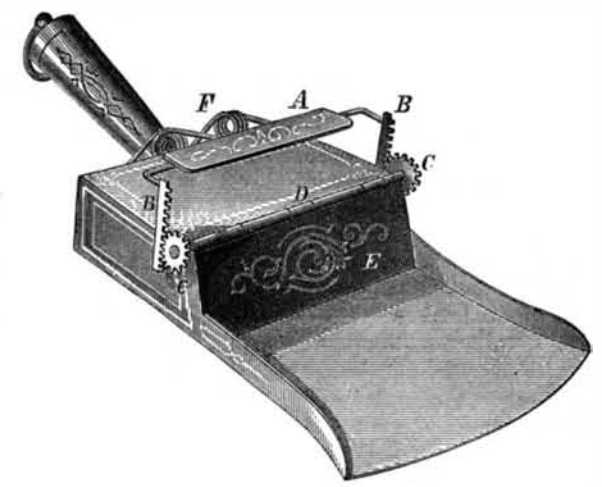
To Remove Tin from Tinned Copper.

Professor Boettger has recently described an easy and practical method of removing the tin from tinned copper vessels or utensils. The vessel to be cleaned is filled with, or immersed in, a solution of sesquichloride of iron. In a few minutes, according to the thickness of the tin, it will be entirely removed, and it is only necessary to polish the copper with sand slightly moistened with very dilute hydrochloric acid.

IMPROVED DUSTPAN.

This dustpan is provided with a recess or box, of convenient size, to hold sweepings, dust, etc. A door is connected in front of the recess or box, and can be opened and shut by means of a lever constructed for that purpose.

The operation is as follows: Pressure on the thumbpiece, A, depresses the vertical ratchet bars, B B, which revolve the cogs, C, with their axle, D, and raises the door, E, when the dust or sweepings can be swept in the box or recess; then,



relaxing the pressure on thumbpiece, A, the spiral spring, F, forces the door in its proper place, and prevents the dust or sweepings from spilling.

Patented May 24, 1875, by Walter J. Parker, of San José, Cal.

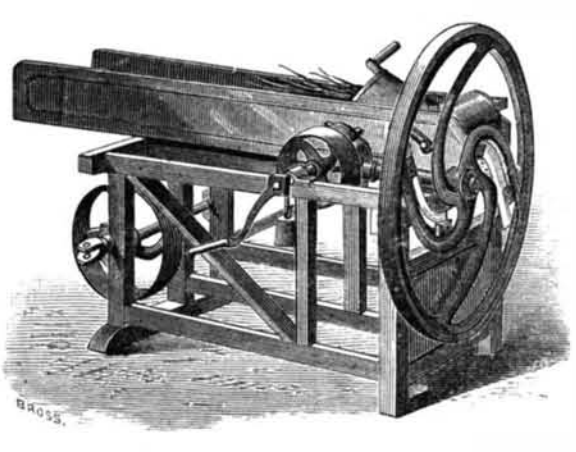
The Great Coal Fields of Ohio.

A district of one hundred miles square, including the counties of Athens, Perry, and Hocking, is the future coal field of this nation. It is to be the "Black Country" of the United States, as the noted district in Staffordshire is the "Black Country" of Great Britain. In fifty years it will probably equal Staffordshire or any district in the world. This district has twenty-two feet of solid coal in five seams. The great vein (properly "bed") is in places twelve feet thick, and nowhere less than six feet. Mingled among the coal beds are inexhaustible beds of iron. The thickest is five feet deep at the outcrop; the thinnest, in places, sinks to six inches. But the thickness of neither seam is quite persistent; there are "waves" from time to time, which narrow the seam. The coal, on the contrary, may be said to run from hill to hill with perfect uniformity. Limestone is also present in any desired quantity.—*Nelsonville (O.) Gazette.*

IMPROVED FEED CUTTER.

A feed cutter is deemed an indispensable adjunct to the farm and stable. Many forms are used, some of simple while others are of more complicated structure. In nearly all of the cutters, as used, the length of the material as cut is arbitrary, there being no means provided to readily change the mechanism so as to produce cut feed of varying lengths.

The machine which we illustrate in the annexed engraving is intended to obviate some of these difficulties, and can be set so as to cut feed from one quarter inch to one inch. As will be seen in the engraving, the knives are arranged upon and attached to the curved spokes of the fly wheel, and can be set, by means of set and binding screws, to cut the length of feed desired. When operated by hand, the power is applied to cranks, of which there are two, one on each side of the machine, and their rotation, by means of miter gears, causes the revolution of the fly wheel with knives attached Upon the shaft, to which the cranks are attached, is seen a pulley, which may receive motion from the pulley shown under the rear portion of the cutting box, which pulley,



in turn, may be rotated by a shaft attached to a horse or steam power.

Patented through the Scientific American Patent Agency, July 17, 1877, by Charles Silberzahn and Herman Heyssen, of Sheboygan, Wis., to whom reference is made for further particulars.

DURING 1876 the quantity of fruit canned in Cincinnati was as follows: Tomatoes, 1,200,000 cans; blackberries, 60,000 cans; raspberries, 120,000 cans; cherries, 60,000 cans; damson plums, 72,000 cans; string beans, 36,000 cans; pickles, 6,000 packages; tomato catsup, 500 barrels.

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IMPROVED CONCRETE MIXER.

We are indebted to *Iron* for the engravings and description of this mixer, the advantages of which are its portability, compact shape, and self-contained arrangements, which permit of its being easily moved from place to place, and used in different parts of a work, thus dispensing with a mixing platform and measures. Another point is that nothing is left to the judgment of the workman. The proportion of materials is predetermined, as well as the number of revolutions necessary; so that, with but little supervision, a concrete of uniform quality is produced.

The mixing chamber may be said to be of trapezoidal form, with its two longest planes at right angles to each other, rotating on a horizontal axis; this arrangement is adopted in order that the stuff falling from a contracted into an enlarged space or capacity may be thoroughly rolled over, and therefore intimately incorporated. When the chamber is half filled with the materials for making concrete, the whole contents are turned over sideways, as well as endways, four times in each revolution of the chamber, so that in from six to twelve revolutions—the number necessary being varied according to the weight and nature of the materials—a more perfect mixture is effected than can be produced by hand. Fig. 2 shows a vertical section through the mixing chamber, the dotted lines representing the altered view of the mixer after a quarter revolution. Fig. 1 shows the mixer mounted on a stout timber frame supported on four flanged wheels for running on rails, though plain wheels may be substituted for ordinary ground. In this arrangement it is driven by four men by means of gear, which can be adjusted to move the truck along, or can be thrown out when the truck is propelled by other means. The truck also carries, at one end, a tank holding the proper quantity of water for a charge of concrete, and at the other end a davit, from which is suspended a hopper for holding the materials, the cement being supplied in bags, ready for being run into the mixer. This arrangement is adopted for filling concrete into a trench or the heating of a pier, the mixer being supported over the opening on two balks of timber, and a wagon containing the materials following on the same line.

To receive a charge, the door of a mixer is brought uppermost, a catch in the cogs of one of the wheels holding it in that position. The door is allowed to rest on a stay provided for that purpose, as shown by dotted lines in Fig. 2. The hopper containing the materials in proper proportion is swung round on the davit to the position shown in dotted lines; and while the materials fall into the mixer, the water contained in the tank is allowed to run in by a flexible hose. The hopper is then swung clear of the mixer, the door closed, and the requisite number of turns given. To save the necessity of counting or guessing, a simple tell-tale is added for giving notice when a sufficient number of revolutions (as determined by the weight and nature of the materials) has been given. A screw thread is cut on the projecting end of the mixer shaft, and an iron plate with a hole in it is hung on the screw. The rotation of the shaft causes the plate to move towards the end until it drops off, and thus indicates that the determined number of revolutions has been accomplished. For a less number of revolutions, a nut or distance piece of the required thickness is put on the end of the shaft. When the proper number of turns has been given, the mixer is stopped with the door downwards, the door fastening is released, and the charge of concrete falls in a mass into its place, the discharge being instantaneous. The mixer is then turned, so that the door comes upward again, and refilled as before. While the mixer is being turned, two men fill the hopper from a wagon with raised sides.

Fig. 3 shows the arrangement of the machine for making concrete blocks for pier and harbor works. The mixer is mounted on a light traveling frame, capable of being moved from one mould to another; and the materials, filled into a large tray, holding from 10 to 15 tons, are lifted on to a raised portion of the travelingframe by the steam traveling crane, which removes the concrete blocks when formed.

It is stated that, with this mixer turned by hand, a gang of six men, with a boy for attending to the water cistern, can make from 30 to 40 cubic yards of concrete blocks, or a much larger quantity of concrete in bulk, in a day, of better quality and at a cheaper rate than can be done by shovel mixing; and that when the mixers are turned by steam, twice these quantities are produced.

Fig. 1.

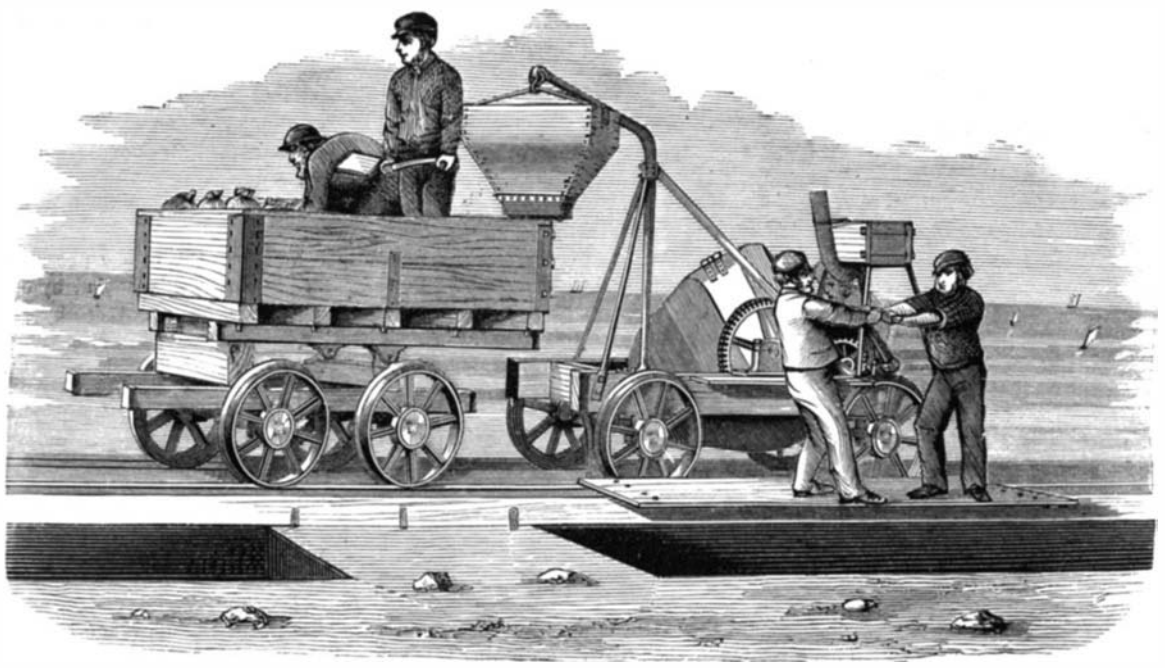


Fig. 2

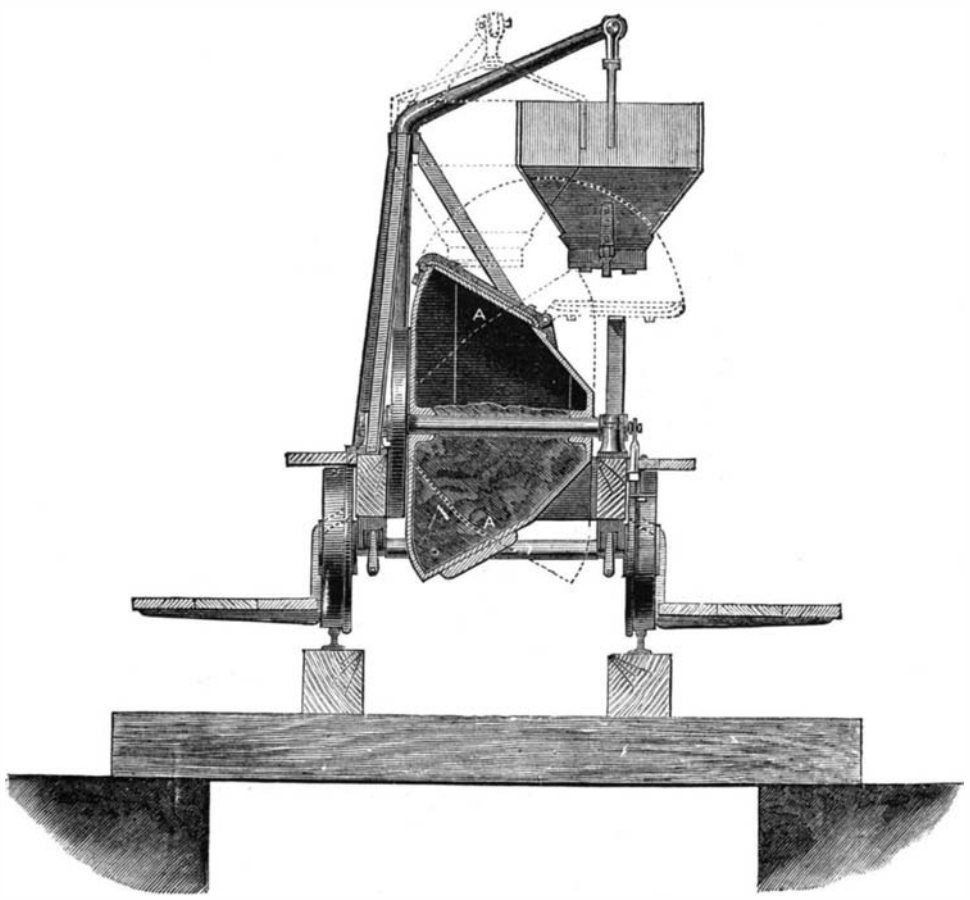
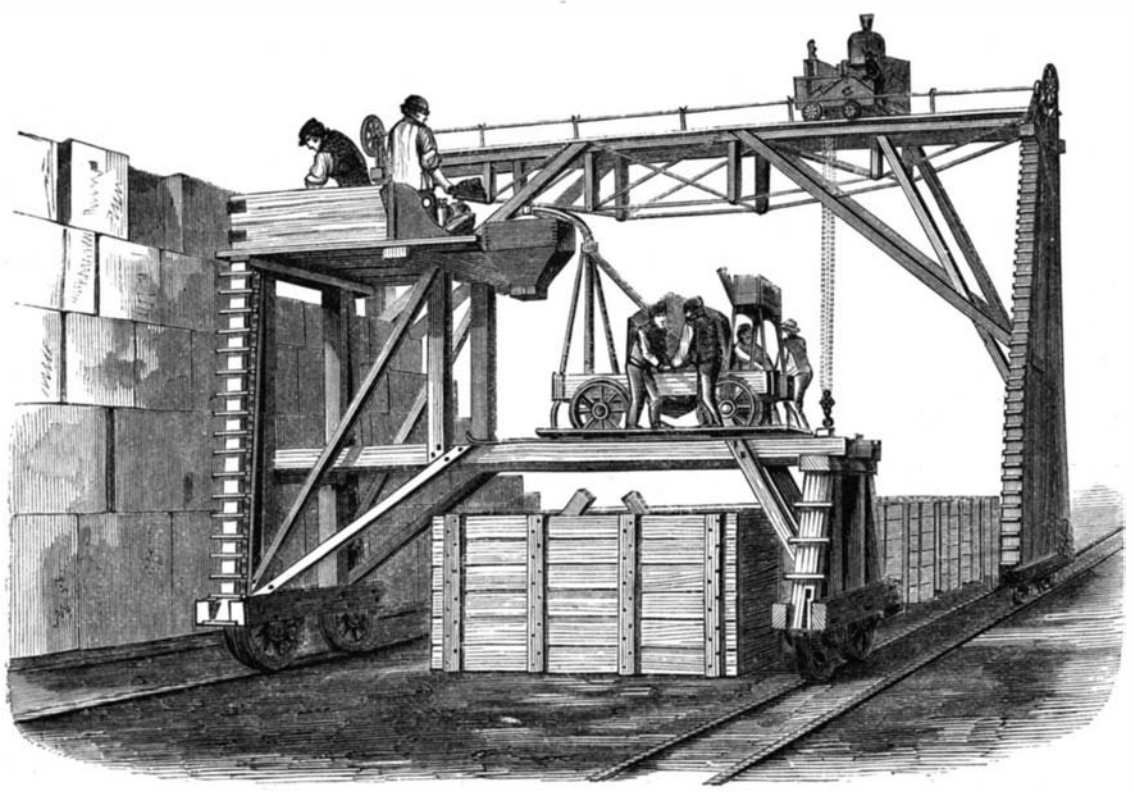


Fig. 3.



MESSENT'S IMPROVED CONCRETE MIXER.

Venus' Slippers.

Mr. F. Buckland, in *Land and Water*, says "These slippers are far more beautiful than anything ever yet turned out in the workshop of a London or Parisian ladies' bootmaker. They are found floating far out at sea in the Mediterranean, on the French coast. Each slipper is about an inch and a half in length, and half an inch in the widest part. They are of a lovely glass-like consistence, and in certain light resplendent like jelly fish. They are the shape of a handsome shoe: the edge of the shoe projects in a very ornamental dentated margin, and the toe part is highly ornamental, as if with embroidery insertion. Mr. M. Latham says: 'It is a kind of jelly fish; I have had considerable difficulty in finding out its real nature. At last I ascertained that it is one of the *pteropoda*, or wing-footed molluscs.' The Rev. J. Wood writes: 'These are so-called from the fin-like lobes that project from the sides, and are evidently analogous to the similar organs in some of the sea snails. These appendages are used almost like wings, the creature flapping its way vigorously through the water, just as a butterfly urges its devious course through the air. They are found in the hotter seas, swimming boldly in vast multitudes amid the wide waters, and one species (*Clio borealis*) has long been celebrated as furnishing the huge Greenland whale with the greater part of its subsistence. The scientific name of it is *cymbulia*, so called on account of its being so like a boat.' We read: 'Cuvier describes the *cymbulia* as having a cartilaginous or gelatinous envelope in the form of a boat or slipper, beset with points in longitudinal rows; and the animal as possessing two great wings, which are at once branchiæ and fins, and between them, on the open side, a third smaller lobe, which is three-pointed. The mouth, provided with two small tentacula, is placed between the wings towards the shut side of the cell, and above are two small eyes. The transparency of the texture permits the internal organs to be distinguished with great facility. The shell is cartilaginous, translucent, oblong in the form of a slipper, and entirely covered with a delicate and scarcely visible membrane.'

"These slippers of the Marine Venus are so beautiful in form and structure that I propose, if possible, to have a model of them cut in crystal. In the form of ear rings they would make very pretty ornaments, as showing the *chaussure* of Cinderella of the Ocean."

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Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

In a previous letter I mentioned a decision of the Commissioner of Patents in the matter of Mr. Sargent's application for a patent on combined time and combination locks, awarding priority to Sargent. Since that decision the attorneys for the Yale Lock Co., the opposing party, have filed a bill in the Supreme Court of the District of Columbia to try the title to the invention *de novo*, and subsequently made a motion before the Commissioner to suspend the issue of the patent to Sargent until the termination of the suit, which motion has been granted.

For two or three years past some of the Virginian farmers have been complaining of what they called the "root disease" in their wheat, and this season some of them wrote to the Commissioner of Agriculture requesting him to send some one down to investigate the matter. Professor Taylor, the microscopist of the department, was accordingly sent to examine into the matter, and after spending some days there returned and reported that no such disease as was reported existed. From his investigation it appears that the soil in the locality said to be infected with the disease was simply worn out, and that the report of the disease is said to have arisen from the fact that one of the farmers, observing barren spots in his wheat fields, examined the roots of his wheat at such points and discovered what seemed to him a peculiar web-like appearance, which he supposed to be of fungoid character; and this explanation of the presence of such barren spots appears to have been accepted without question by so many others that the "root disease" came to be considered as an established fact; and in some places farmers had abandoned wheat growing on account of it. Professor Taylor examined this supposed fungoid matter with the microscope, and found it to consist only of the minute rootlets of the plant itself. An examination of the wheat growing on the barren spots and that on more favored localities developed the fact that, the more vigorous the plants, the more of these rootlets there were, showing conclusively that this supposed "root disease" was no cause for the barren places. Mr. Taylor is convinced that the barren spots referred to are due solely to the lack of nutriment in the soil, and that the failure of wheat in such places, which really has formed the only ground of complaint, may easily be remedied by the use of fertilizers and proper treatment of the soil.

The monitor Wyandotte, just manned and equipped at our Navy Yard, was on the verge of going into commission and about to put off to sea, when it was suddenly discovered that she was leaking badly along one of the seams from near her bow to aft of the turret. A board of survey was at once formed, which, after due examination, condemned her as unseaworthy. It seems rather curious how a leak of the extent reported should fail to be discovered until the vessel was all ready for sea.

Several experiments have recently been conducted on the United States steamer Hartford by Captain S. B. Luce, with a patent magneto-electric lamp, which it is proposed to introduce into the navy for distant signalling at night, detecting the approach of boats or torpedoes, picking up buoys, etc. The lamp produces a steady light for three and a half hours, which is visible for fifteen miles. One has been purchased for the Hartford, which will be used for further experiments to determine as to the advisability of introducing these lamps into general use in the navy.

Some time since the Treasury appointed several commissions to examine the question of the rates of drawback on the exportations of sugars and syrups refined from imported raw sugars, and the following are the recommendations of the Baltimore, Boston, and New York commissions:

The majority of the Baltimore Commission recommend that the existing rates of drawback, namely, $3\frac{60}{100}$ cents per lb. on refined hard sugar; 3 cents per lb. on soft, 20 D. S., in color; $2\frac{1}{2}$ cents per lb. on soft, below 20 D. S.; and $6\frac{1}{4}$ cents per gallon on syrup, be left unchanged. The minority report of the same commission recommends that for hard sugars produced by refiners using raw sugars known as "Centrifugals" and "Vacuum Pan," a reduction of $\frac{5}{100}$ of a cent be made from the present for each per centum of raw sugars of that description operated upon. This would make the drawback on hard sugars produced wholly from this class of raw sugars $3\frac{10}{100}$ cents per lb. The Boston Commission recommended the following rates: On hard sugars, $4\frac{18}{100}$ cents per lb.; on soft, above No. 20 D. S., $2\frac{58}{100}$ cents per lb.; and on syrup, $6\frac{1}{4}$ cents per gallon. The rates recommended by the New York Commission are as follows: On hard sugars, 3 cents per lb.; on soft sugars, above No. 20 D. S., $2\frac{1}{2}$ cents per lb.; on soft, No. 20 and below, $2\frac{10}{100}$ cents per lb.; and on syrup, $5\frac{1}{4}$ cents per gallon.

The Bureau of Statistics report that during the month of June there were exported from the United States 2,832,116 yards of colored and 7,855,309 yards of uncolored cotton cloths, which with other cotton goods exported are valued at $939,831. During the past fiscal year, the total value of cotton goods exported was $10,180,984. During the preceding year the total amounted only to $7,722,978.

A short time since the Treasury advertised for bids for printing bank checks at so much per thousand, and there was so much rivalry between the American Phototype Company and the Graphic Company that each of them determined to get it if possible. The Phototype Company bid for the job at $\frac{1}{100}$ of a mill per thousand; and the Graphic, not to be beaten, offered to do it for nothing, and the contract was awarded to the latter as the lowest bidder. The Phototype Company now appear by counsel before Assistant Secretary French and ask that the contract made with the Graphic Company be set aside, on the ground that the bid of the latter was not in accordance with the terms of the advertisement, which called for bids "at so much per thousand," and that "nothing" was not so much per thousand. The Secretary has not given his decision yet, but it is believed he will differ from the learned counsel of the Phototype Company.

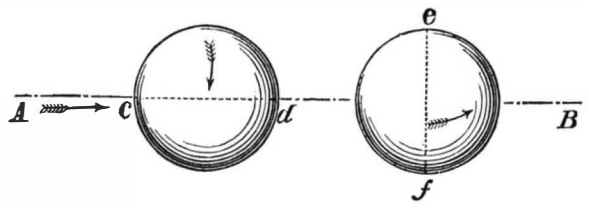
Washington, D. C. OCCASIONAL.

Curving a Base Ball.

To the Editor of the Scientific American:

I see by a reply to one of your correspondents that you seem to doubt the possibility of this feat. That a ball may be thrown with a curve seems to be an undisputed proposition among players, and it may, I think, be accounted for on the principle of unequal momenta of different parts of the ball.

Let us suppose that the ball is thrown in the direction A B, as shown in the cut, with no attempt at a curve. It will



probably leave the pitcher's hand spinning on an axis, *c d*, in the direction of the arrow. Assuming this axis to be perfectly horizontal, the ball will move in a straight line to B, or rather in a parabola in a vertical plane. Now suppose the pitcher, on letting go the ball, to bring the axis, *c d*, to the position, *e f*, perpendicular to *c d*. Then the motion is in the direction of the arrow around *e f*. The posterior half of the ball, *ef*, has two motions, its motion of revolution and its forward motion. The forces which produce these motions being in opposite directions, the momentum of the side will be produced by the difference of their resultants. The anterior half, however, must be influenced by the sum of the resultants of its similar forces, and hence have a superior momentum. And also the side having the least momentum would affect the ball so as to draw it in its own direction. Hence the ball, which is supposed to be thrown toward B directly, would curve off and strike at a point left of B.

By throwing the ball in such a manner that the axis, *c d*, would attain the position, *e f*, at a point a little beyond the middle of its course, the first half of its trajectory would be nearly straight, and it would curve off on the second. By varying the direction of revolution other curves may be produced. My theory is perhaps not correct, but it is the only one which appears at all satisfactory to me.

New Haven, Conn. H. C.

Rotation in Motion.

To the Editor of the Scientific American:

In making calculations for the path of projectiles until quite recently no account has been taken of rotation. If we are to speak correctly no projectile ever describes a parabola, and yet the parabolic curve is made the basis of calculation for all practice in gunnery.

The resistance of the air is no inconsiderable element in calculating the paths of projectiles. But rotation adds another element of even greater importance coupled with atmospheric resistance. It was probably first brought to notice by a series of experiments in gunnery with a smooth-bored piece. In leaving room about the ball for windage it was noticed that the ball balloted from side to side in passing out the piece. The last ballot gave the ball a backward rotation on the side of its tangency, and consequently a forward rotation on the free side. At the same time the ball was deflected out of its course by the last touch, but the accumulated resistance of the air on that side deflects it back again. Thus if a ball last ballots upon the right side it receives a right hand rotation (looking down upon it) about a perpendicular axis. At the same time by touching it is deflected from its course to the left. But owing to its right hand rotation the left side of the ball comes in contact with more molecules of air than the right, and encounters greater resistance. The compression of the air on that side deflects the ball to the right. Hence the ball describes a curve aside from the so-called parabolic curve. If the ball had balloted last on the left side it would have received a left hand rotation and first been deflected to the right and afterwards curved to the left, on account of greater resistance of the air on its left. By balloting on the bottom last it would first rise and then fall, and by balloting on the top last it would fall and afterward rise. Thus it is possible with a smooth-bored gun to shoot round a near object and hit a remote object when both are in a right line.

A ball may be thrown from the hand so as to show the same remarkable effect of rotation. By throwing the ball so as to retard the motion on the left side as the ball leaves the hand, the ball receives a left hand rotation; if the angular velocity is as great as the velocity of translation, the left side meets almost no resistance, while the right meets a double resistance equal to both angular and forward. The air is compressed ahead and to the right of the ball, and it is deflected toward the left. Sometimes this deflection amounts to five or six feet in a course of fifty feet. If the ball is thrown with a right hand rotation it comes round to the right. If a forward rotation (like that of a ball rolled along the floor) the ball will curve down much sooner than it would acted upon by gravity alone. If the rotation be backward, the ball will curve upward until gravity overcomes its initial velocity, and it does not begin to fall as soon as when acted on by gravity alone. J. G. MCMURPHY.

Racine, Wis.

An Artificial Summer Shower.

To the Editor of the Scientific American:

A few weeks ago, while thinking with some anxiety of the dangers which the approaching hot weather might bring to his teething child, the idea occurred to the writer that the temperature of a heated room might be lowered by keeping the window awnings saturated with water or any volatile fluid.

By this means not only would the air which entered the windows be cooled by contact with the cool wet surface of the canvas but also by evaporation of the moisture from the awnings. Accordingly, on the following day, a brass tube having an internal diameter of $\frac{1}{4}$ of an inch was so placed that it would lie across the outside surface of the awning at a distance of a few inches from the upper edge, which is attached by hooks and rings to the house. The ends of the tube, being bent at right angles to the tube, hung down by the sides of the awning about 6 inches. All along the side of the tube which touched the awning were drilled, at intervals of 3 inches, holes about the size of a pin. One end of the brass tube was closed and over the other end was slipped a small india rubber tube. This tube was carried in at the open window and connected by an ordinary screw coupling to the nearest cold water faucet. The awnings of three windows of the nursery having been supplied with this simple apparatus, the water was turned on, and, after passing through the rubber tubing, escaped through the perforations in the metal tubes and, flowing evenly over the front and sides of the awnings, dripped upon the tin roof of the porch below the windows—a miniature summer shower. In a short time a refreshing coolness and moisture of the atmosphere reminded one of breezes blowing into the windows from off the surface of a lake. A thermometer hung outside of the window under the awning, while still dry, showed a temperature of $97\frac{1}{2}°$ Fah. Upon turning the water on, the mercury sank in 15 minutes to 90° Fah., the thermometer still hanging below the awning, but protected from contact with the water. A still more marked effect might be produced by passing the rubber tube through a pail of broken ice. The apparatus is inexpensive; the amount of water used is small, while the comfort it might bring to a sick child or a feeble invalid might be very great. The apparatus does not interfere with the raising or lowering of the awning; and should the dripping be objectionable where there is no roof below to receive it, a small gutter of canvas or metal could readily be attached to the lower edge of the awning to carry off the water; or a smaller flow of water may be used, enough only to keep the canvas moist.

Morristown, N. J. HENRY N. DODGE, M.D.

India Rubber Hose.

To the Editor of the Scientific American:

It seems to me that a little more care in the manufacture of rubber hose would double, treble, quadruple its value. It is lined with a thin coat of rubber, which is supposed to be so perfect in its continuity as to protect the cotton body of the hose from water, but it is not so. There are many points in it where water finds its way through, so that the cotton duck, of which the body of the hose is made, soon decays.

I have a large quantity of inch and a quarter garden hose, two or three years old, that has become quite troublesome. Each piece of hose is fifty feet long, and in each length there will be two, three, four, or more spots where the water will break through, although the bad parts are not a tenth part of the whole, that is, of the entire length of the hose; the lining membrane of rubber seems to be perfect in at least nine tenths of it. Why cannot the other tenth be made perfect? It seems to me the additional cost of manufacture would be very little more, but the value of the hose would be at least doubled.

Portland, Me. N. D.

Fish from an Artesian Well.

At a recent meeting of the San Francisco Academy of Sciences, specimens of fish, supposed to be trout, were presented, accompanied by a letter from Thomas R. Bard, of Hueneme, Ventura county, Cal. They were thrown up from an artesian well 141 feet deep near that place. The well, which is nearly 300 feet deep from high water mark, was bored in 1871, and ever since has thrown out immense quantities of freshly spawned fish in April and May. The first fish this year were observed in March. The well is capped, having three two-inch apertures, from one of which people were in the habit of filling barrels of water for household uses. In that way the presence of fish was discovered in 1872. The cap was removed and fish were ejected in incredible quantities, until the cap was replaced. The fish are said to be of various sizes, the largest about an inch in length. The nearest stream where fish are found is Santa Paula Creek, twenty-five miles from the well, but it empties in the Santa Clara river, at a point twenty miles distant.

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THE WATCH—ITS INVENTION AND HISTORY.

In our last issue we gave an account of the history of the invention of the watch; and this week we resume the subject, but confining ourselves more to its introduction into society and describing some of the more remarkable specimens now in existence.

In the early days of watchmaking, from their comparatively high price, watches were great rarities, and were found only in the hands of the very wealthy, but it soon became the rage among those who could indulge in such a luxury to make collections of them, and among others Charles V., who, it is said, after retiring from his throne to a monastery, spent much time in trying to make a lot of watches all keep time alike, which he could not do, from which he sagely drew the conclusion that he must have been a great fool to spend so much blood and treasure as he had done to make men all think the same way, when he could not even make a few watches agree. The story further states that one of the monks entering the king's cell accidentally upset the table on which the watches were placed, upon which the king remarked that the monk had easily accomplished what he himself had vainly tried to do —to make the watches all go together.

Diana of Poictiers, the mistress of Henry II., being a widow, the courtiers of the period, to ingratiate themselves in her favor, used to present her with watches in such shapes as coffins, skulls, etc., and it became the fashion to have them made in this lugubrious style. Mary, Queen of Scots, is said to have had several such, and she gave one to Mary Letoun in 1587, which is still in existence. It was made by Moyse, of Blois, France, and has been thus described: The watch has a silver casing in the form of a skull, which separated at the jaws so as to expose the dial, which is also of silver, occupying about the position of the palate, and is fixed in a golden circle with the hours in Roman letters. The movement appropriately occupies the place of the brains, but is enclosed in a bell, filling the hollow of the skull, which bell is struck by the hammer to sound the hours. The case is highly ornamented with fine engravings, showing on the front of the skull Death standing between a cottage and a palace; in the rear is Time devouring all things; on one side of the upper part of the skull are Adam and Eve in the Garden of Eden with the serpent tempting Eve; on the opposite side is the crucifixion. Inside on the plate or lid is the Holy Family in the stable, with the infant Jesus in the manger and angels ministering to him. In the distance are the shepherds with their flocks, etc. The works are said to be in good order and to perform astonishingly well.

Many of the watches of this period, besides being made of the peculiar shapes before mentioned, were set in crystal cases, so that their works might be seen in motion; others were set in perfume and snuff boxes, saddle pommels, canes, and at a later period in finger-rings, shirt studs, bracelets, and other articles of personal wear; and it is said that a striking watch, small enough to be mounted in a ring, was made by an Italian goldsmith as long ago as 1542.

Queen Elizabeth had a large number of watches, many of which were presented to her by her favorites, or those who wished to become so. There is a list extant of over a score of these articles which she owned. Many of these are mentioned as "clocks," but it is evident from the context that most of them were watches.

Lady Fitzgerald, an English lady who has several remarkable watches of different periods, has one of Elizabeth's time which is in the form of a silver duck, with the feathers in chased work. The lower part opens to expose the dial plate, which is of silver encircled with a gilt design of floriated scrolls and angels' heads. At the back of the neck is a ring to which a chain is attached. The same lady has one representing Jupiter and Ganymede, with the movement contained in the body of the bird. It is so made that, when not suspended to the girdle by a ring in the bird's beak, it will stand on its claws. She has also a cruciform watch of about 1700, covered with elaborate engravings of a delicate character. The center of the dial plate has a representation of Christ's agony in the garden, the outer compartments being occupied by the emblems of the passion and the lowermost by a figure of Faith.

A watch said to have been made by Hans John, of Konigsberg, about the 17th century, is stated to have the earliest known instance of a chain on the fusee, and it is peculiar in other respects, as it has a small wheel-lock pistol to serve as an alarm.

Watches were such a rarity in 1630 that it is said a Dr. Allan, who had the reputation of being a wizard, happening to leave his watch in a bedroom in a house where he was visiting in the country, came near losing it because the chambermaid who found it thought it was the doctor's "familiar spirit." She therefore took it up with a pair of tongs and threw it out of the window into the moat "to drown the devil;" but as "one who is born to be hanged cannot be drowned," the watch, when search was made for it, was found hanging on a bush growing on the bank of the moat, on which it had accidentally caught in its flight through the air. This failure in her attempt only the more confirmed the girl in her idea, and she could not be prevailed upon to touch the watch. Thirty-five years after this Pepys, in his diary (December 22, 1665), made the following entry, which shows that even then the sight of the internal mechanism of a watch was so much of a curiosity that he was "mightily pleased and satisfied with it:" "I to my Lord Brouncker's and there spent the evening, by my desire, in seeing his lordship open to pieces and make up again his watch, thereby being taught what I never knew before, and it is a thing very well worth my having seen and am mightily pleased and satisfied with it."

Watches after this period and during the eighteenth century came gradually into use among the wealthier people, but they were still of great cost, which was further increased by excessive ornamentation and by many of them being made as repeaters, which were then the fashionable watches. Another style of watch was also then in vogue, called "touch watches," with which the time could be felt in the dark. These watches were made of different styles, one of the best of which had projections on the back corresponding to the different hours on the face, and a movable or independent hand which could be turned round with the finger until it was opposite the hour hand, when it could be moved no further.

In 1769 George II. had a watch presented to him of which one hand took a year to make a revolution, and was used to point out the month and day of the month. It also had a brilliant to represent the sun, set on a plate which regularly revolved to perform its apparent diurnal revolution. On the plate was a movable horizon to show the variation of the days according to the season of the year.

In the same year Ranzonet, a Lorraine watchmaker, made a watch of the common size containing a musical instrument that played an air *en duo*, and none of the parts of the musical mechanism interfered with the time works.

In the Museum of Dover, England, is a watch of about the same date as above, of an oval shape, like the Nuremberg eggs, having two movable dials, one having the numerals of the month, etc., and near the center are the signs of the zodiac; the fixed part around which it revolves has the abbreviated names of the months. The outer dial has merely the hours upon it. There is also a revolving plate below the surface bearing upon it the days of the week. Other apertures show the month and the day of the month, and another the moon's position. The hands move in the opposite direction to those of the watches of the present day.

During the reign of Catherine II. of Russia, Kalutin, a peasant, made a musical repeating watch about the size of an egg, which had within it a representation of Christ's tomb with sentinels on watch. On pressing a spring the stone would be rolled from the tomb, the sentinels fall down, the angels appear, the holy women enter the sepulchre, and the same chant which is sung in the Greek church on Easter eve accurately performed. It is now in the Academy of Sciences at St. Petersburgh.

About 1770 it became the fashion to wear two watches. In a rhyming receipt of this date, "To Make a Modern Fop," appear the lines:

"A lofty cane, a sword with silver hilt,
A ring, *two watches*, and a snuff-box gilt."

The ladies soon adopted this fashion, but as watches were still very expensive, mock watches were often substituted, some being of costly materials while others were cheap imitations. The Chinese of the present day wear two watches when they wear any at all, for the reason "spose one makee sick and die" the other one "still lives." Chinese timekeepers have twenty-four hours shown on the dial.

Keyless watches now so much worn have long been known but have not been used much until of late years. Napoleon I. possessed one that at every step he took caused a weight to act on the end of a lever having a weak spring under it, which was attached to a click working into a ratchet wheel on the barrel arbor and so wound up the main spring. In the Kensington Museum in London there is a pedometer, operated in a similar manner, combined with a watch, so that the same instrument tells the time and also the distance walked by the wearer during the day. A watch in the United States Patent Office is wound up by closing the case after looking at the face to see the time. It has an attachment to throw the winding device out of gear when the spring is wound up.

Among the remarkable watches may be cited one on exhibition in New Haven, Conn., which is thus described by Mark Twain:

"I have examined the wonderful watch made by M. Matile, and it comes nearer to being a human being than any piece of mechanism I ever saw before. It knows considerable more than the average voter. It knows the movements of the moon and tells the day of the week, the month, and will do this perpetually; it tells the hour of the day, the minute, and the second, and splits the seconds into fifths, and marks the divisions by stop hands; having two stop hands, it can take care of two race horses that start one after the other; it is a repeater, wherein the voter is suggested again; musically chimes the hour, the quarter, the half, the three-quarter hour, and also the minutes that have passed of an incompleted quarter hour—so that a blind man can tell the time of day by it to the exact minute. Such is this extraordinary watch. It cyphers to admiration. I should think one could add another wheel and make it read and write; still another and make it talk; and I think one might take out several of the wheels that are already in it, and it would still be a more intelligent citizen than some that help to govern the country. On the whole I think it is entitled to vote—that is, if its sex is of the right kind."

When speaking of curious watches we should not forget that the commonest watch made would, if it were the only one in existence, be considered a marvellous piece of workmanship, hardly second to any of man's creation, but as every one now carries a watch, it barely excites more curiosity than a pocket-knife. Independent of the completed watch as an automatic machine, let us consider some of the curiosities of its manufacture. Take, for instance, the small screws, some of which are so small that they look like grains of fine sand, and will require 150,000 to weigh a pound, yet all of these when examined under a microscope look like finely finished little bolts, each having a perfect thread, although so fine as to take 250 turns to measure one inch. These screws are now made by the American Watch Company by an automatic machine, which only requires to be supplied with the necessary quantity of wire and power to keep it in motion, to turn out these infinitesimal screws all complete, except tempering. If we examine the chain used in most English watches we find it to be only about six inches long, and yet it has 630 pieces in it. The hair-spring may also be considered as one of its curiosities. To the naked eye it looks like a hair, but under a glass it is shown to be a flat steel ribbon, which a suitable gage will show to be only $\frac{3}{2500}$ of an inch thick, or about one half the thickness of a hair; and although from six to eight inches long, yet it is said that it takes about 25,000 to weigh a pound. It has been frequently cited as an instance of the value given to raw materials by manufacturing into finished articles, as a pound of finest hair springs, selling for thousands of dollars, may be made from metal which in its crudest state cost but a few cents.

Leaving the component parts of the watch and considering the number of ticks the completed article will make, we arrive at some extraordinary figures. Many watches make five ticks per second, 300 each minute, 18,000 in every hour, and 432,000 per day. Thus we see that by a half dozen turns of the key once a day, occupying a few seconds, we store up a modicum of power in the spring that is cut up into near a half million of beats which are spread over the whole day, any successive two of which are precisely the same distance of time apart as any other succeeding two at any time of the day or night. If, now, we multiply the daily beats by $365\frac{1}{4}$ we shall obtain the number of beats in a year, which are 157,788,000—a number of which we can have but a slight conception, except from some calculation of this kind, although it may help to give us some idea of our national debt. If our worthy Secretary of the Treasury should engage to pay off this debt and should detail a sufficient number of clerks to put down a dollar for every tick of a watch, night and day, it would be over thirteen years before they would get through with their job of paying off the principal—to say nothing of the interest. This, however, is a digression, and we had better return, as the French say, "to our *moutons*"—or rather, our *montres*.

Many of our elderly readers no doubt remember the printed "watch papers" that used to be put by the watchmakers, as business cards, into the bulky watches used by our grandfathers. These were sometimes enlivened with a couplet or verse, some of which seem worth preserving, for instance, this one, which hath a flavor of worldly wisdom:

"He that wears a watch, two things must do:
Pocket his *watch* and *watch* his *pocket* too!"

Or this one, which savors more of heavenly things:

"I labor here with all my might
To tell the hours of day and night;
Therefore example take by me,
And serve the Lord as I serve thee."

As one of the "Curiosities of Literature" connected with watches, we may cite the following, which can be seen in the churchyard at Lydford, Devonshire, England, and is something in the style of Benjamin Franklin's celebrated epitaph:

"Here lies in a *horizontal* position
The *outside case* of
George Routledge, Watchmaker,
Integrity was the *main spring* and prudence the *regulator* of all the *actions* of his life;
Humane, generous, and liberal,
His *hand* never *stopped* till he had relieved distress;
So nicely *regulated* were his *movements* that he never *went wrong*,
Except when *set agoing* by people who did not know his *key*;
Even then he was easily *set right* again.
He had the art of disposing of his *time* so well
That his *hours* glided away in one continued *round* of pleasure,
Till in an unlucky *moment* his pulse *stopped beating*.
He *ran down* Nov. 14, 1802, aged 57,
In hopes of being *taken in hand* by his Maker,
Thoroughly *cleaned*, *repaired*, *wound up*, and *set agoing*
In the world to come when *time* shall be no more."

Test for Free Sulphuric Acid in Vinegar.

The impression popularly prevails that vinegar is frequently strengthened by the addition of sulphuric acid, hence numerous tests for this acid have been proposed. Natural vinegar contains sulphates, hence chloride of barium always forms a precipitate, whether sulphuric acid has been added or not. The simplest test for free acid is that proposed by G. Witz, namely, methyl-aniline violet. Acetic acid has no effect upon this dye, but the smallest trace of free mineral acid, hydrochloric, sulphuric, or nitric, changes it to green or bluish green. To make the test he dissolves 1 part of methyl-aniline violet in 2,000 parts of water (5 centigrams to 100 c. c.) and adds a single drop of this solution to about 25 c.c. ($\frac{5}{6}$ ounce) of the vinegar to be tested. If the slightest amount of sulphuric acid has been added to the vinegar the above mentioned change of color is noticed.

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IMPROVED CARPET LOOM.

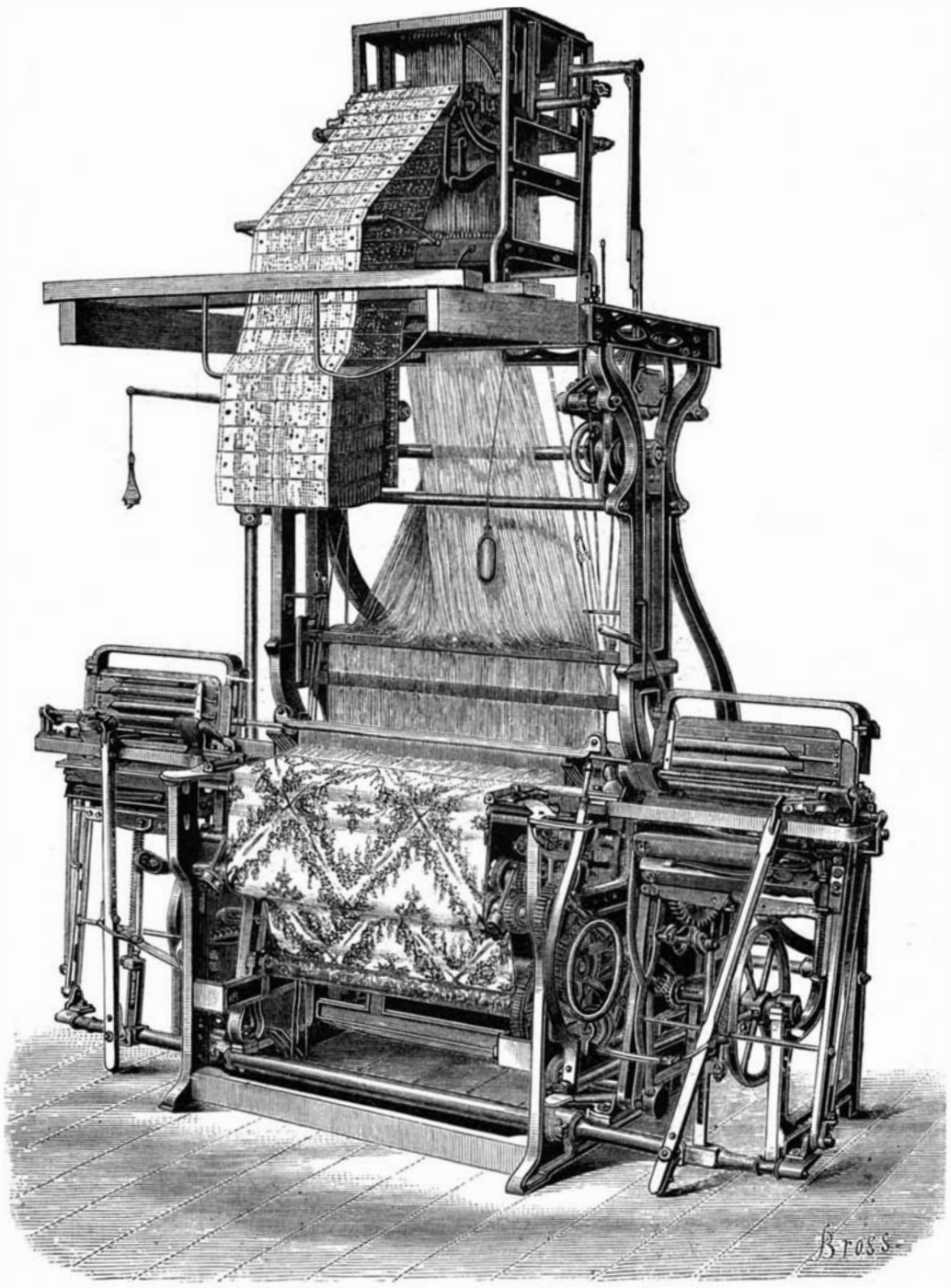
The loom herewith illustrated is the invention of Mr. Josiah Gates, and has a considerable number of practical improvements embodied in its construction, which mark it as a distinct step in advance of our present looms. One prominent feature is the use of a combined set of reciprocating and revolving shuttle boxes, thus allowing an exceptionably large number of different colors or shades to be used when desired, namely, as many as sixteen. The use of shaded colors in producing a graduated succession of tints in lighter and darker shades is certainly a most artistic improvement over the vividly contrasted colors so largely in use in our present carpet and general woven fabrics.

The use of the combined set of revolving reciprocating shuttle boxes permits the use of a few shuttles only when a small number of colors are all that are required. That is to say, the three upper shuttle boxes and the uppermost box of the revolving set make a set of four reciprocating shuttle boxes without the use of the revolving gear at all, which may then be thrown out of action, and all the wear and tear of its working parts thus be saved. The reciprocating and revolving action of the shuttle boxes are obtained in the ordinary way by the use of fingers upon the usual perforated cardboard pattern, and which, upon dropping through the pattern, cause the corresponding shuttle box to be brought into the requisite position for delivery across the material.

The loom is fitted with a peculiar double-beat lay, and combined positive motion of the shuttle, which is of great value in the weaving of heavy fibrous material, such as rattan, matting, and other long coarse fibrous substances. The double-beat lay is obtained by means of grooved cams upon the main shaft, and acting upon connecting rods or levers slotted on the shaft and connected with the lay, the cams being constructed with two eccentric operating or pressing points and a depression between them. At each revolution of the shaft and the cams the two eccentric points of each cam successively act upon the roll of the slotted lever, and thus produce the double beat or repeating action of the lay. Either of the eccentric or operating points of the cams may be varied, and one may extend beyond the other to produce one full beat and one partial beat, which in some cases may be preferable, as the repeating action is intended for clearing the sheds and for more thoroughly beating up the filling. By giving the second beat a greater amount of force a firmer and closer texture of fabric may be produced, since the second beat of the lay takes place on the cross shade or as the new shade is formed.

A double-beat action of the lay has already been used in England in many looms; but to the best of our knowledge, it has hitherto been produced by the duplex action of a toggle joint, which can only give two successive blows of equal travel and intensity. By the use of the double-throw cams in the Gates loom the two beats may be timed at any suitable interval after each other, and the blows may be varied in intensity to suit any requirements.

This loom is also provided with an improved take-up apparatus, in which the tension is very ingeniously exactly suited to the draught of the material so as at no time to injuriously strain the fabric. This improvement we illustrate in detail, Fig. 2. A^2 represents the cloth roll, and it has a ratchet wheel, B, on one end, a little inside the sword, C, rising from the rocker shaft, E, and arranged to work in the usual way. The cloth roll is shorter than the loom, and it is supported in bearings on an open bracket, D, projecting inward from the end frame, F, leaving room between the frame and the bracket for the oscillating sword and the ratchet wheel.

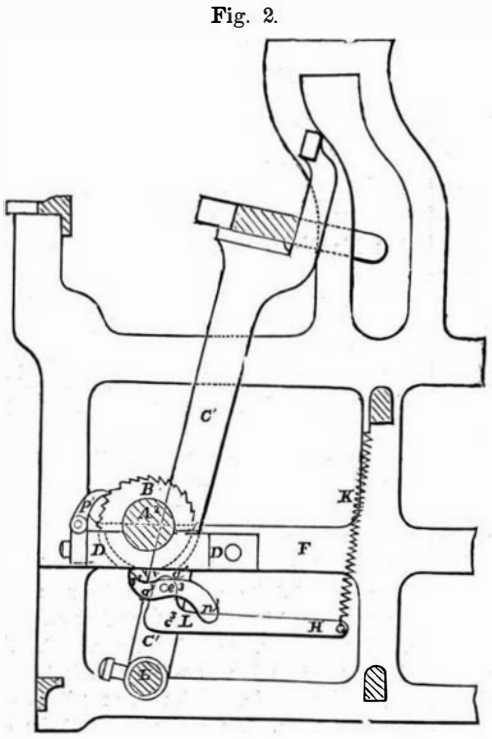


THE GATES POWER CARPET LOOM.—Fig. 1.

At the forward side of the loom, and hung to the bracket or other support, is a pawl, P, to hold the wheel against the draught or unwinding action of the cloth upon the roll. In practice the pawl, P^1, is in two parts, that is, a long and a short pawl to catch and hold on the distance of half a tooth, one pawl catching ahead of the other, and *vice versa*. To the lower portion of the sword, C^1, a lever of a peculiar construction is pivoted at C^3, and a lug or arm, d^1, rises at right angles to the lever, and to this ear a counterbalance pawl, g^3, is hung near its center by any easy working joint or a pivot, e^3. The outer end, n^1, being most weighty, holds the catch end, S^2, in contact with the teeth of the wheel, B^1.

The arm, H, of the lever extends rearward, as shown, and a spring, K, is attached to its end and to some fixed object or part of the frame. The backward and forward motions of the sword impart the same motions to the lever and the pawl, g^3, causing the latter to engage with the teeth of the wheel, and when the cloth is slackened by the introduction of filling in the web, and by the action of the let-off mechanism, the motion and power of the oscillating sword causes the connected pawl, g, to turn the wheel and the roll, and to wind up the cloth as fast as it is woven. The introduction of the tension spring, K, is here most valuable. At some occasions during the weaving of the cloth and the winding, the rate of let-off may not exactly correspond to that of the winding on, and at the same time there is always a certain tension most suitable for taking up the cloth. When the forward motion of the sword brings the pawl into contact with the tooth of the wheel, the wheel may be either driven forward, or, if the resistance be great, the spring, K, will yield and allow the end of the lever, H, to depress under the action of the rock of the sword, instead of the ratchet wheel being driven by the pawl. The tension with which the cloth is wound up will thus depend upon the tension of the spring, and thus will remain tolerably regular, and may be adjusted to any required winding-up tension.

Fig. 2.



The other detail we illustrate is an improved bobbin catch, by means of which the momentum of the bobbin is allowed to be gradually taken up by the action of a longitudinal spring. When the shuttle is set in sudden motion by a blow, the bobbin in this case first compresses the spring, and thus more gradually acquires its velocity, thereby saving a considerable portion of the filling, which, in an ordinary bobbin, is either separated or loosened. The same gradual stoppage of the bobbin by a spring cushion takes place when the shuttle is driven home, and many filling bobbins are thereby saved, which, in an ordinary shuttle, are split by the sudden stoppage of the shuttle.

Fig. 3 is an underside view, and Fig. 4 a longitudinal section of the rear end of a weaver's shuttle, with the spring recoil above referred to. A is the bobbin catch, constructed with a longitudinal slot, b, and a rising rear end, d^3, and furnished with a spiral spring, E, and a retaining pin, f^2, while the shuttle is supplied, near the forward end of the bobbin-catch mortise, with a stop or bar, c^1, as a bearing for the forward end of the spring.

The usual fulcrum pin, e^5, passes through the slot, b, and this allows the bobbin catch and the bobbin to move forward, or to yield to the action of the blow of the shuttle when its forward end strikes. The spring, E^1, instantly returns the bobbin and catch, or draws them back after each blow of the forward end of the shuttle. The spring acts between the bar, c^4, secured to the substance of the shuttle, and the ear, d^3, rising from rear end of the bobbin catch plate, while the pin, f^2, projecting forward from the ear, holds this end of the spring in position, not only when in action but also when the rear end of the bobbin catch is passed upward to release the catch end from the groove, g^6, in the bobbin.

Fig. 3.

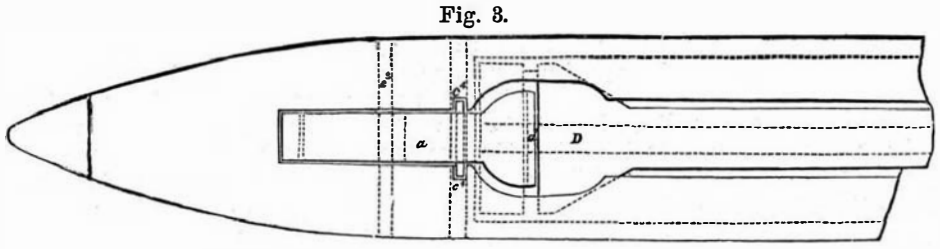
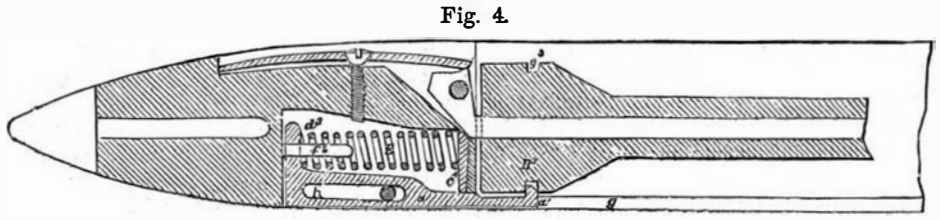


Fig. 4.



The Gates machine is supplied with a most perfect automatic gear by means of which the action of the filling beat is at once checked and thrown out of action if the shuttle has not been fully returned home after its last traverse across the warp. In this way, should a shuttle be caught and not reach its box, the action of the lay is instantly suspended, and the shuttle replaced without any injury having been done to the warp.

This loom is being introduced into England, and as many

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as 225 of them are running in this country. The speed at which the looms may be run seems also to be exceptionably high—so much so as to give a maximum production, with skilled labor, of 35 yards of carpet per day. The general all-round average production per day, amongst a variety of labor, is about 25 yards per day, which certainly speaks well for the construction and easy working of the loom.

THE WATER SNAKE—HOW IT EATS.

BY C. FEW SEISS.

If we wish to keep serpents alive and healthy in captivity they must of course be fed. They must, with few exceptions, have living food. I have endeavored in various ways to entice them to eat raw beef, without, however, any success. In only one instance, I believe, did I ever succeed in making a serpent devour a lifeless object. This was a water snake which I enticed to seize and swallow a dead minnow by moving it rapidly about in the snake's bath tub, with a piece of slight wire. But even after the fish was seized, I was obliged to move the minnow's tail from side to side, to imitate life, for fear the snake should perceive his mistake and relinquish his hold.

Garter snakes must be fed upon toads and frogs, and water snakes upon frogs, tadpoles, and fishes.

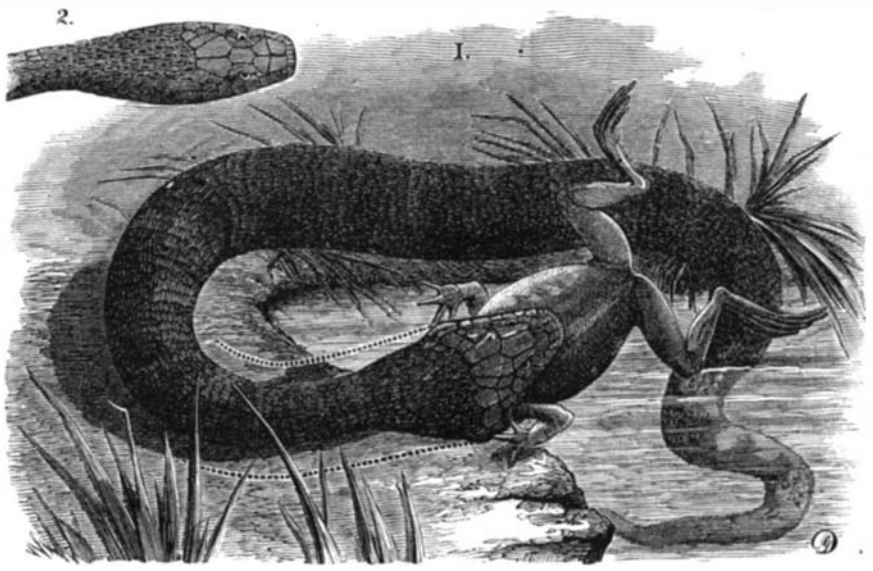
I cannot say I enjoy seeing a snake swallow a frog. The last time I witnessed our water snake (*tropidonotus sipedon*, Linn.) devour a frog, I must confess a feeling of pity for the little frog came upon me. The snake first, by a sudden dart through the water, caught the frog by one of its hind legs. The frog struggled in terror, and madly endeavored to free itself from its ferocious captor. It struggled in vain, for the snake slowly drew the frog into the dark vale from whence no frog ever returns. From the instant the frog was seized, until it was entirely swallowed, and the snake's mouth closed, it cried most piteously, first loudly, but by degrees growing fainter and fainter, until entirely hushed in the gullet of the snake. I imagine I can yet hear that young frog's death cry. It was repeated at intervals, and sounded something like the words "quaak! uck! uck! quaak! uck! uck!" uttered in a plaintive tone.

While the frog was passing through the œsophagus of the snake, and even after it had arrived in the ophidian's stomach, I observed by the external agitation of the snake's body how violently the frog kicked and writhed to extricate itself from its untimely tomb.

It may be said of most serpents that rather than eat, in the general sense of the word, they drag their jaws over and around their prey, previous to swallowing it.

Supposing the object to be made food of by a water snake is a frog. After seizing it, the snake unhooks from the frog the teeth of one side of its upper jaw, and forces them further forward upon the frog, where it rehooks them, and draws them backward; then the teeth of the opposite side of the jaw performs the same action, and thus they move alternately and regularly, the inferior jaw going through much the same action, until the head of the snake is drawn completely over the frog. The snake then forces the frog through its œsophagus to its stomach by violently contracting the muscles of its neck and body, at the same time its neck is contorted in a horizontal waving manner.

When the object swallowed is passing through the œsophagus, and into the stomach of the serpent, that is if the prey be of any considerable size, the ribs expand, widely distending the skin of the neck and body, leaving spaces between the scales, which, being generally light in color, cause the serpent, especially if it be a dark one, to have the appearance of being prettily speckled with white.



THE WATER SNAKE.

Fig. 1 represents a *tropidonotus sipedon* in the act of devouring a frog. The movable quadrate bones are forced outward, thus widely distending the head and neck of the serpent. The dotted line indicates the size of expansion while the frog is passing through the œsophagus of the serpent. Fig. 2 represents the same serpent in a state of quiet. The occipital plates of this specimen are somewhat smaller than they generally are in this species.

SUGAR of lead ground in linseed oil is a good paint dryer.

Reynier's New Electric Lamp.

The author's object in this invention has been to produce an electric lamp capable of acting for 24 hours. He has succeeded in almost completely suppressing the occultations hitherto supposed inherent in the use of discs. M. Cance submitted to the Academy of Paris a novel system of electro-magnets with a multiple nucleus, analogous to that of M. Camacho, but in which the tubular nuclei are replaced by series of small rods of soft iron in juxtaposition and enveloping in pairs the different layers of spirals.

Requirements for a Good Ship's Compass.

In order that a compass may be good, the needle should be very hard and well magnetized so as to retain its power, the cap should be of ruby or agate, carefully hollowed so as to be even and smooth, and the point should be hard, fine, and sharp.

No dirt or dust should be permitted to get into the cap, as it will make the needle sluggish, and enable the point to grind into the cap. The point should be examined from time to time and kept sharp. It is important also that the point should be exactly in the intersection of the two diameters passing through the gimbals, and that it should be exactly at the same height as the centers of the gimbals, a matter frequently neglected by the maker. It has been shown that a compass is more steady, and that the quadrantal correction is more perfect when the card has two parallel needles, the ends of which intersect the circumference of the card at points 60° apart. The admiralty compass has four needles.

If the bowl is of copper, or better if a stout copper ring surrounds the card, the vibrations of the needle will be calmed, that is their amplitude will be reduced, while the time of viration will remain the same, owing to an action being set up which appears to be due to currents generated by the relative motion of the needle and the copper. It may be suggested that no means of cutting off the action of the ship's iron from the compass can be effectual, since anything which will do that will also cut off the action of the earth's magnetism also, and render the compass useless.—*From Fairman Rogers' work on "The Magnetism of Iron Vessels."*

THE CURLY-HAIRED ANTELOPE.

Very little is known of this antelope in its wild state. Siebold, in his "Fauna Japonica," calls it *antelope crêssue*, and mentions that it is known to the Japanese by the name of "Nik," but that it is rarely found, and only then in the highest mountains of the Island of Niphon and Sikok. The appearance of the animal would indicate that it is a hardy inhabitant of a mountainous country.

THE CURLY-HAIRED ANTELOPE.—(JAPANESE CHAMOIS).

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The illustration that we give was drawn from life and gives a good representation of the animal. It is about the size of a goat. Seen from the front, it has a wolf-like appearance, on account of its strong neck, encircling mane, and peculiar color of the head. The coarse long hair of the body is of a light slate color, the points of which are united so as to form tufts or curls. The back, neck, ears, and goat-like tail are of a dark black color. The hair from the eyes towards the forehead, the cheeks, and along the throat is of a dirty grayish white. The short spirally-twisted and backward-bent horns are grooved at their base and are nearly hidden by the long hair of the forehead. The insides of the ears are covered with long and thick hair. The eyes are dark brown. The hoofs are grooved on the inside and terminate in dull points.

A full grown female of this rare species was exhibited at the Zoölogical Gardens, at Cologne, in the winter of 1876. It was unfortunately killed by the inundation of last spring, which overflowed a part of the garden.

KID GLOVES.

The manufacture of kid gloves is an old French industry. Grenoble is the principal seat of the trade, over a third of its inhabitants being engaged in it, and it was from this city that the manufacture was introduced, some three hundred years ago, by wandering craftsmen, into other European cities, especially those of Germany. Paris not long ago grew to be the rival of Grenoble in the trade, mainly through the exertions of Jouvin, who brought the manufacture into prominent notice, and laid the foundation of that world-wide fame which the Parisian kid gloves have ever since enjoyed.

He introduced several important improvements, and was among the first to recognize the great superiority of machine work in his special department.

The French kid glove manufacture gives employment to over 70,000 hands, including those who attend to preparation of the leather. The yearly production amounts to something like 24,000,000 of pairs, representing a value of 80,000,000 francs.

Kid gloves are made of the skins of goats, kids, sheep, and lambs, which are supplied by all European countries, Saxony, however, furnishing the best. Great care is exercised in tanning in order to obtain leather of the required degree of softness and pliability. The dyeing of the leather is carried on in special establishments, for the convenience of glove makers who do not, like larger firms, attend to their own dyeing. The soft gloss of kid gloves is not, as some have been led to suppose, due to any peculiar treatment, but depends upon the quality of the leather and the care expended in its tanning.

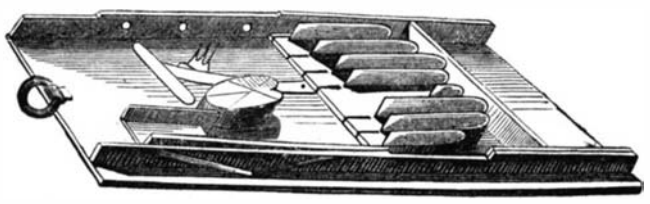


Fig. 1.—FORM FOR CUTTING GLOVE BLANKS.

The hides, after coming from the dyer, are spread out separately upon a marble table with the smooth side down, the other or flesh side being submitted to a scraping process in order to reduce the existing inequalities and to render the skin as smooth and as uniformly thick as possible.

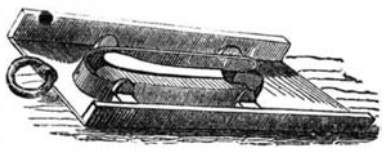


Fig. 2.—FORM FOR CUTTING THE THUMB PIECES.

The leather is now cut into strips of a little over twice the breadth of a hand, and these *établions*, as the French call them, are then stretched for some time in the direction of their length. The cutting, which now follows, was formerly accomplished by first tracing the outline of the glove upon the piece and then using the handshears. Next came sheet iron patterns, which had merely to be pressed upon the soft leather in order to leave an impression of the outline, when the shears as before completed the work. This method is still employed to some extent. The mode of cutting at present almost universally adopted is to stamp the gloves out by means of the contrivance shown in Fig. 1. Steel knives are so arranged upon a board, with their edge uppermost, as to form the outline of a double glove, including the opening for the thumb piece. Four to six pieces of kid of the proper size are placed upon these knives, a board is laid over both, and the whole is then submitted to pressure, after which the gloves, neatly and cleanly cut, are ready to be passed to the seamstress.

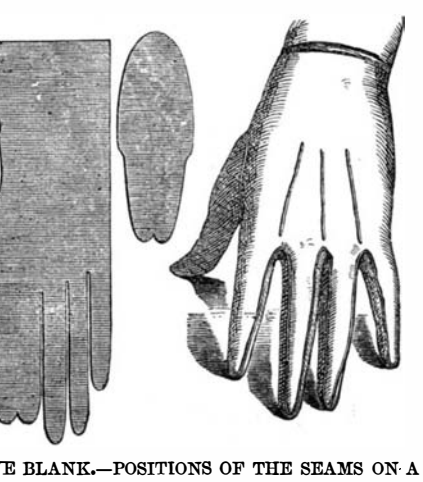


Fig. 3.—GLOVE BLANK.—POSITIONS OF THE SEAMS ON A GLOVE.

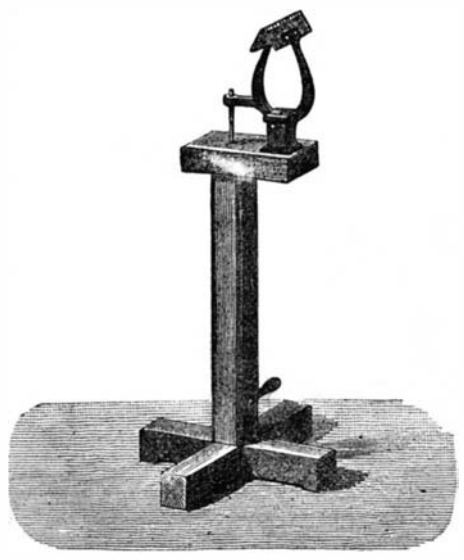


Fig. 4.—MACHINE TO ASSIST IN SEWING.—FRONT VIEW.

A separate apparatus, as shown in Fig. 2, is provided for cutting the thumb pieces. The knives used are made of the very best steel, and demand special accuracy in their manufacture.

In some Parisian factories they have a more complicated form of cutting tool, in which the glove, besides being cut, is provided at the same time with the holes through which the sewing thread is to pass. Such an apparatus has, however, from its complexity, been found to be too uneconomical to warrant its extended introduction.

In sewing the gloves, silk is ordinarily used. A small contrivance is employed for this purpose, which, besides serving to hold the glove while being sewed, furnishes also a guide in making the stitches. As shown in Figs. 4 and 5, it bears some resemblance to a vise, and is ordinarily kept closed by the pressure of a spring, but can be opened at pleasure by means of a treadle. The jaws of this vise are furnished with a pair of brass plates, changeable at will, which have their upper edges provided with a row of teeth, the latter being placed at varying distances apart on different plates.

In sewing, the two portions of the glove are allowed to project slightly above the comb, sufficiently to permit the seam being made with the necessary freedom. The needle is made to pass through the glove in the spaces between each two teeth, and the seam thus acquires its uniform and pleasing appearance. This machine has been in use ever since its invention, in 1807, by James Winter, of England, and is still extensively employed, despite the fact that special sewing machines have been brought to the notice of the trade, capable of sewing within the same time three times as many pair as the most skillful seamstress.

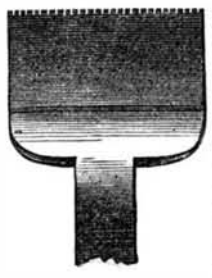


Fig. 5.—Machine to assist in sewing. Side view of head.

After sewing, the gloves undergo various minor operations, such as straightening those portions that may have become distorted, flattening the seams, pressing, etc., and are then ready for the market.

Hyposulphite in Diphtheria.

A very large number of diphtheria cases are cited by a Boston physician as having been successfully treated, in his own practice, by the use of hyposulphite of soda, in doses of from five to fifteen grains or more in syrup every two or three hours, according to age and circumstances; as much as the patient can bear without physicking being a good rule in the severer cases. The tincture can be used in doses of five drops to half a drachm, in milk, the amount for thorough stimulation being greater than can be taken in water, and, in the treatment of children, the milk thus used answers for food. As, however, the hyposulphite prevents the digestion of milk, it should not be given in less than an hour from it, though they may be used alternately, in frequent doses.

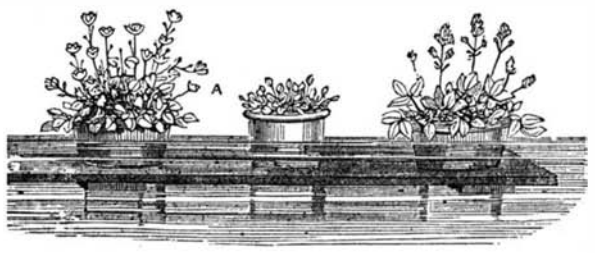
GRAVITY OF WOODS.—The woods which are heavier than water are Dutch box, Indian cedar, ebony, lignum-vitæ, mahogany, heart of oak, pomegranate, vine. Lignum vitæ is one third heavier, pomegranate rather more. On the other hand, cork, having a specific gravity of ·24, and poplar, ·383, are the lightest woody products.

Freezing Point of Ether.

Our common ethylic ether, improperly called sulphuric ether, because made by the action of sulphuric acid upon alcohol, is known to be a substance which does not freeze very readily. Its freezing point has been variously stated by different investigators, but Franchiment thinks that pure ether cannot be frozen. He has cooled it to —80° C. (—112° Fah.) and it remained a thin liquid showing no signs of crystallization. In ether containing any water, white crystalline flakes form at a very low temperature, but the less water there is present the lower the temperature required will be, and the smaller the quantity of crystals. Franchimont thinks that these flakes are not crystals of ether, but ice crystals. The question seems to be one not easily settled, for few experimenters care to work at such extremely low temperatures, obtainable only by the expenditure of so much time, labor, and expense.

A FLOATING FLOWER BED.

G. F. Wilson in *The Garden* gives his experience of a float which he has successfully used in the cultivation of bog and water plants, and says: The raft is 8 feet square and consists of nine planks, connected underneath by crosspieces, and having about 2 inches open spaces between; this was sunk by the weight of the pots, pans, and pieces of rock to 2 or 3 inches under the surface. On the raft bog plants in pots and water plants in pans were placed, with the result that, with no attention, they flourish as well as in their natural homes. After a time, when the wood has become saturated with water, and its floating power thus lessened, we nailed large pieces of cork underneath the raft; this enabled it to carry a heavy load. The plants now growing on the raft number twenty, and were chosen as representative plants. There are the North American pitcher plant (*sarracenia purpurea*), *saxifraga palmata*, buck beans, bog violets (*pinguicula vulgaris*), grass of Parnassus, several sorts of mimulus—the spotted mimulus overgrows its pan, and with floating roots in the water is most beautiful—*lobelia cardinalis*, bog myrtle, a large variety of yellow iris, and North American lady's slipper (*cypripedium spectabile*). It is obvious that, while the raft floats between 2 inches and 3 inches under water, each



pan or pot may be adjusted according to the requirement of its inhabitant; thus a water plant is sunk to the full depth, while a plant requiring only moist soil is raised up by a piece of wood placed under its pot. Probably a still more ornamental form would be a round raft of wood with cork or wood fastened with copper nails to form sides, the bottom to have only small holes all over to admit the water; there might be cross divisions for different mixtures of soil suitable for the various plants, made not deep enough to show above the surface; in this case the whole raft would be covered with soil, and all woodwork, except the sides, hidden.

A Fertilizer from Blood.

A Frenchman named Lissagaray has taken out a Bavarian patent for making a fertilizer from blood. High pressure steam is first passed into the blood so as to cause it to boil and coagulate the albumen. The coagulated blood, while still hot, is pumped up on a linen filter stretched across a frame, and the greater part of the liquid drained off from the coagulum, which is packed in bags made of stronger linen, piled one upon the other, and squeezed between the plates of a hydraulic press, then dried in a wheel divided into four compartments, into which is passed hot air. In this way the nitrogenous portion of the blood is all retained in a form in which it is not liable to immediate decomposition, rendering it less offensive to handle and transport. If the blood be subjected to this treatment while fresh, the operation should not be particularly disagreeable.

Tellurious Odors.

Some salts of bismuth, more especially the nitrate and carbonate, have recently come into favor, and been prescribed by medical men for certain disorders of the system (*Ann. Pharm.*) It has been remarked in several cases in England that persons to whom either of these preparations had been administered were affected in an unaccountable way, the breath and skin acquiring an intolerable odor. It appeared at first sight probable that the cause lay in the presence of arsenic in the bismuth, but analysis of the salts has shown them to be contaminated with tellurium. Tetradymite, a compound of bismuth and tellurium, is a mineral which has been met with in many localities, and may easily have caused the contamination of the crude metal.

We may add that among workers in ores containing tellurium in Colorado, it is well known that, if they inhale the vapors of that metal, or take it into the system, they soon begin to emit from every pore an odor, compared with which the smell of rotten eggs, sulphuretted hydrogen, or bisulphide of carbon are savory substances. Tellurium is a metal resembling tin in color, but it has many of the characteristics of sulphur.

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Henry Ward Beecher on the Railway Strike.

There is no class of men who deserve the gratitude of the community more than those who operate our great railroads. I shall not satisfy myself if I do not express the gratitude which I feel, and which I think every man should feel, for that most honorable class of laboring men in our midst. Considering the vast extent of these roads; considering how they have changed the forms even of industry and civilization; considering how the industrial interests and the very happiness of society are dependent on them; considering what an instrumentality the railroad system has become in the civilization of our land and in our time—considering these things, the men who conduct this system and make it successful are certainly worthy of consideration. Civilization would be obstructed and in many respects destroyed but for these workers upon this multiplex and universal machine. The faithful men who operate it are responsible for an incalculable trust; and in general they execute that trust so as to demand recognition and gratitude on every hand. In all weather, by night and by day, they toil, carrying their lives in their hands. No man more than the engineer sows without reaping. No man carries such responsibility with so little remuneration. Millions of men by his care and fidelity are sped upon their errands safe from disaster who give him never a second thought.

The general sobriety of all the operatives on our great roads, and their usual carefulness, are unquestionable. Myriads of men daily are indebted to them. Their heroism often breaks forth in most illustrious acts. It is seldom that in any great catastrophe we do not hear of some among the engineers and their faithful assistants who heroically risk their lives. The stationary men who care for the depot, the switchmen and the brakemen, all of them, though humble in position, are indispensable parts of a machine whose workings are a marvel of modern civilization.

These men, hundreds and thousands and thousands of thousands in number, are, as a class, men that are seeking to become more and more self-respecting men. They organize themselves into "unions" for mutual insurance, for fellowship in life, for succor in sickness, and for an honorable burial when they die. For the exclusion of evil men from their ranks, they organize themselves. There is a moral purpose that animates them. They seek for intelligence, sobriety, and fidelity among themselves, and for mutual protection against the natural selfishness of employers and capital.

Thus far their organizations are eminently wise; but there is a foreign element which has come into these "unions" in America. It is a poisonous element. It is a usurpation of authority over one's fellow workmen. It is an assumption of right by the exercise of force to compass their ends—an assumption which surpasses the most bitter tyranny of Europe, and which would not be tolerated a day in a crowned head. What right has any association of men to say to the master mason, "You shall not work as a laboring man on your own contracts?" What right have they to say to an employer, "You shall never have more than five or six apprentices to learn this trade?" What right have they to say to him, "You shall employ nobody but 'union' men?" What right have they to dictate to free men as to how they shall carry on their business? They have a right to say, "If your business is carried on in a way that is prejudicial to our interest we will not work for you." The continent is large; the door to enterprise is open for all; and let no man be compelled to work where it is not for his interest to work; but who clothed any of these "unions" with authority to say, "Such men shall work, and only such men shall work; so many shall work, and only so many shall work; they shall work under such conditions, and they shall work only under such conditions?" It is a denial of freedom, it is a blow at personal independence and popular liberty; and if there were any considerable danger of its spreading, if it did not carry in itself the elements of its sure defeat, it would be time to raise the banner and lift the voice like a trumpet, against this clandestine industrial tyranny.

It is the virus that has vitiated the course of these disaffected railroad laborers; and it is a subject of profound regret to all who sympathize with them that they have put themselves in an attitude in which their friends cannot defend them, and in which the public peace and safety require that they should be resisted and subdued.

The reduction of their wages is the solitary grievance which is alleged as an excuse for their misconduct. But men whose pay is not sufficient have a right to refuse to work for the pay. They are not bound to work for less than they deserve. But they have forbidden those men who are willing to work for that pay to avail themselves of it. It is not enough for them to say, each man for himself, "I will not work for one dollar a day," but they turn to their neighbor and say, "Neither shall you." They say, "I have a family to support, and a dollar and a half never can feed my children;" and when a man who is without a family says, "It will feed me," the response is, "It shall not feed you; for if I will not work for that, neither shall you work for it." They have seized the property of companies, and domineered it. They have taken the law into their own hands—or, rather, they have trodden it under their own feet. They have disturbed the public peace by riot and violence against the State laws, and against the laws of the whole of these United States. They have thrown the vast business interests of this country into confusion. And, that every element of blame may rest upon them, they have shed the blood of those who have the authority of their State in their hands. And this has been done, evidently, by a combination running through the whole country, from ocean to ocean. It exhibits the tendency of a class interest to seek its ends, not by open, reasonable methods, but by an organized conspiracy which has in it every element both of opprobrium and of peril.

The strike went to show that labor had not received its full remuneration; that working men were subjected to a great many petty injustices, and that the way of acquiring prosperity was not the way of the grog shop. It was by the way of more work, better work, more refinement, nobler ambitions and larger manhood. Discontentment and strikes did no good, neither did the attempt to make men work eight hours with wages of fifteen. It is an American doctrine that every man must stand upon his own level. It is said that the world owes every man a living. That is so when a man earns it. Again, that the world should take care of all men. Man was born to take care of himself, but sometimes he is cared for by his mother, and afterward by his wife. Man should be valued according to his achievements. If he achieved as much as a fly he is entitled to an equal reward for what he did. If he is an eagle, he has a right to the whole air. No man has a right to go high by artificial merits; it must be through merit. Men may go into a rebellion, and learn that two pounds weigh more than one. The law of nature is on the side of two pounds. A man who drinks beer and grumbles, and works one tenth of the day, says that he is as good as the next man. That depends on who is the next man.

The test of all governments and combinations was, "How much individual liberty did they secure to each one?" To restrict the individuality of a single man was pernicious and poisonous. The tyranny of combinations was just as much a tyranny as that of the despot upon the throne. Human nature was the same all the world over. He said it would be the glory of his life if he might see the majority of the working men happy in houses of their own. In speaking of the adversity that overtakes many, he said that when a man has hard times he should not grumble or complain. He ought to be manly enough to be manly when he is poor as well as when he is rich. When he comes down to a single dollar a day, must he throw up his hands in despair? Is that the manly course for a man? If you are being reduced, go down boldly to poverty. Bankruptcy never hurts a man until it takes his manhood. Working man, work more and grumble less. Mr. Beecher said that he did not say that a dollar a day was enough for a working man, but it would give a man bread. Man ought to be superior to his circumstances. He should not suffer the outside world to shake him. He should stand, not crawl. Don't sneak, but bear adversity as well as prosperity.

A NEW method of preserving the bodies of the dead has just been exhibited in Berlin. It is the invention of a Mr. Tominetti of Hamburg, and consists in a thorough drying of the tissues by means of an injected gas, which absorbs the moisture and drives it out through the pores. Prepared in this way, an animal preserves its form and color in perfection. Mr. Tominetti exhibited a bear which had thus been treated after his death four months previously. Slices were cut from the body to show that the tissues were not destroyed but, except for their desiccation, were preserved in excellent condition.

Inventions Patented in England by Americans.

July 10 to July 17, 1877, inclusive.

BALE TIE.—S. N. Drake *et al.*, New Orleans, La
BLIND ROLLER.—Henry Hughes (of San Francisco, Cal.), London, Eng.
BOOT AND SHOE MACHINE.—G. W. Copeland *et al.*, Malden, Mass.
BUTTER TRAY, ETC.—C. Ingersoll, Beloit, Wis.
DOOR AND WINDOW SASH.—H. E. Russell, New Britain, Conn.
GAS APPARATUS.—E. T. Thomas, New York city.
GAS LIGHTER —K. Vogel, Chelsea, Mass.
HERMETICALLY SEALED PACKAGES.—C. Lewis, Boston, Mass.
LOCK.—H. E. Russell, New Britain, Conn.
LUBRICATOR.—R. Hawarth, New York city.
MOULDING MACHINERY.—A. K. Rider, Walden, N. Y.
OZONE, PURIFYING.—F. W. Bartlett, Buffalo, N. Y.
PLAITING MACHINE.—H Albrecht, Philadelphia, Pa.
SAW BLADES, MANUFACTURING.—J. A. House, Bridgeport, Conn.
SHEET METAL PIPE.—H. K. Flager, Boston, Mass.
STEAM PACKING.—H. Greenough, Boston, Mass.
TOY.—L. Seasongood, Cincinnati, O.
WATER METER.—H. B. Hayes, Woburn, Mass.
WOODEN SOLED SHOES.—T. R. Hyde, Westerly, R. I.

NEW BOOKS AND PUBLICATIONS.

A POPULAR TREATISE ON WATER SUPPLY ENGINEERING: relating to the Hydrology, Hydronamics, and Practical Construction of Water Works in North America. With numerous Tables and Illustrations. By J. T. Fanning, C.E. New York: D. Van Nostrand, Publisher, 23 Murray street. 1877.

The author says in his preface that this work is intended more for those who have already had a task assigned for them, and who, as commissioner, engineer, or assistant, are to proceed at once upon their reconnoissance and surveys, and the preparation of plans for a public water supply. Its aim is to develop the bases and principles of construction, rather than to trace the origin of or to describe individual works. The book is divided into three sections, the first treating upon the collection and storage of water in its impurities; the second upon flow of water through sluices, pipes, and channels; the third, practical construction of water works. In the introductory chapter of the first section the influences of a liberal water supply are pointed out, and then follow statistics and tables of water supplied to various American and foreign cities, the ratios of consumption during the different seasons, and the reserve capacity necessary to provide water for the use of a fire department. To those who have to estimate large quantities of water the statistics and diagrams will prove of great value. The hydrology of the United States is discussed in chapters relating to rainfall, flow of streams, storage and evaporation of water, supplying capacity of water sheds and supplies from wells and streams. The second section opens with special characteristics of water, its weight, pressure and motion, and is followed with chapters on the flow of water through orifices, ajutages, pipes under pressure, upon channels, and to measuring weirs and weir gauging. The third section includes about one half the entire book and embraces the practical construction of water works. The first subjects discussed are reservoirs, embankments and chambers, and canal banks. The proportions of waste ways and the safety valves of embankments are fully discussed. Waste weirs and dams of masonry and timber cribwork are exemplified and described. Following this are chapters on proportions, construction, and laying of conduits of masonry and mains and distribution pipes of metal, and the valves, hydrants, and appendages of the distribution systems. The clarification of water is fully discussed and sediments and impurities are duly considered, the processes of treatment by infiltrations, precipitations, and filtrations are described. The management and maintenance of filter beds and basins are illustrated and described. The concluding chapter is a brief discussion of the several systems of water supply, and includes a review of the methods of gathering and delivering water, choice of water, systems of pumping, etc. An appendix is added, giving tables, equivalents and formulas, of value to hydraulic and mechanical engineers.

THE ANTELOPE AND DEER OF AMERICA. A comprehensive scientific treatise upon the natural history, including the characteristics, habits, affinities, and capacity for domestication, of the Antilocapra and Cervidæ of North America. By John Dean Caton, LL.D. New York: Published by Hurd & Houghton. Boston: H. O. Houghton and Company. Cambridge: The Riverside Press. 1877.

The author says that the natural history of these animals, the pursuit of which has been his favorite recreation, has occupied his leisure for many years, during which time he has kept in domestication all of the American deer of which he treats, except the moose and the two species of caribou. This has given him opportunities of making observations of them, which in the wild state he could not do. The habit of noting these observations accumulated a vast amount of facts, which those competent to judge deemed of scientific value, and so he was induced to put them in a form that would be available to others. He makes no attempt to exhaust the natural history of the few animals of which he treats, but contents himself with a mere monograph of them, leaving their osteology and anatomy almost entirely for other hands, invading their province only so far as is necessary to give completeness to the externals of the animals studied. His aim has been to carefully observe facts and to accurately state them, and to truly exhibit nature and her workings. In the illustrations he has tried to make them true to nature regardless of the question whether they were ornamental pictures or not. The full figures, as far as possible, are drawn from photographs, taken while the animals were standing at ease, believing in this way he could give a truer idea of them than when they were made to assume striking and unusual attitudes, although these attitudes might be more attractive to the eye. The book is written in a free and easy style, interspersed with anecdotes enough to make it interesting, even to those who care but little for the subject which the author has chosen for his discourse.

AN ELEMENTARY COURSE OF CIVIL ENGINEERING FOR THE USE OF CADETS OF THE UNITED STATES MILITARY ACADEMY. By I. B. Wheeler, Professor of Civil and Military Engineering in the United States Military Academy, at West Point, N. Y., and Brevet-Colonel, U. S. Army. New York: John Wiley & Sons, 15 Astor Place. 1877. Price $4.

This treatise has been compiled and arranged especially for the use of cadets of the United States Military Academy and with regard to the limited time allowed them for instruction in this branch of their studies. The author defines civil engineering as the designing and building of all works intended for the comfort of man, or to improve the country by beautifying it or increasing its prosperity, and gives in regular order the elementary principles, common to all branches of engineering, which are essential for the student to learn, that he may understand the nature of the engineer's profession, and know how to apply the principles that he has already acquired. In the first part, building materials are taken up; and under the head of wood, all kinds of timber are treated upon, their kinds, classes, defects, durability, and preservation, noticed. Stones, bricks, concretes, and glass follow. The metals used in engineering constructions are then taken up; uniting materials as glue, lime, cements, and mortars follow, and preservatives as paint, japanning, oiling, varnishes, coal tar, asphaltum, metal covering, etc., close this part of the work. Part second treats upon the strength of materials, as strains, tension, compression, shearing, flexure, torsion and strength of bearing. Part third treats of framing. Part fourth of masonry and masonry construction. Part fifth of foundations on land and in water. Part sixth of bridges, as trussed, tubular or iron plate, arched, suspension, movable and aqueduct, and of bridge construction in general. Part seventh treats of roofs, and part eighth of roads, their location and construction, closing with a chapter on railroads and one upon canals.

THEORY OF TRANSVERSE STRAINS, AND ITS APPLICATION TO THE CONSTRUCTION OF BUILDINGS. By R. G. Hatfield, Architect, Fellow of Am. Inst. Architects; Mem. Am. Soc. Civil Engineers; Author of the American House Carpenter. John Wiley & Sons. Price $6.

This book is intended especially for architects and for students in architecture and contains much that should be useful to civil engineers. Those who can command the time to read the work carefully through will here find the subject of construction so far as it applies to floors, girders and roofs, carefully elaborated and thoroughly elucidated, algebraically, graphically, and arithmetically. Those who have not the leisure for studying the work in detail may still derive assistance from its many useful results; which are classified in a directory, showing at a glance the particular rule needed in any given case, whether it be of a lever, a beam, a tier of beams, a header, a carriage beam with one, two, or three headers, a girder, solid, framed, or tubular, or a roof truss; and for those who are very limited in time, there are tables containing the dimensions required for floor beams and headers, of four several kinds of wood and of rolled iron; and all these are for dwellings, office buildings, halls of assembly, and first class stores. There is a table showing the thickness of floors made of timber, solid. In many other tables are recorded the results of experiments upon several of our American woods, made by the author expressly for this work, to test their resistance to flexure, rupture, tension, compression and sliding. Other tables give the values of constants which are derived from these experiments and which are used in the rules given in the body of the work. This feature gives to the work its great practical value, as well as the manner in which the principles of the science have been so carefully and lucidly developed. This work ought to become popular with students; the steps by which access is gained to the more intricate portions of the subjects treated are so easy and gradual that those even whose knowledge of algebra is quite limited will, by ordinary attention, be able to progress satisfactorily, and in a reasonable time become familiar with the more important of the subjects treated. To secure a knowledge of the useful results to the student unversed in even the simpler processes of algebra, a practical example is given to elucidate every rule, in which the practical application of the rule is shown by arithmetical processes worked out in detail. For the purpose of fixing in the mind of the student the subject matter of each chapter, there are appended questions of a practical nature, and at the end of the work the answers to these questions are given. An extended index, as well as a table of contents, will facilitate the labors of those who have occasion to consult its pages upon any particular subject.

REPORT OF THE DIRECTORS OF CENTRAL PARK MENAGERIE; Department of Public Parks, City of New York, for the year 1876.

The additions to the menagerie of the Park during the year are: mammals, 197, birds 145, and reptiles 51. The number of animals was 983. As compared with previous years, the donations have gradually decreased, which is attributable to the establishment of zoological gardens in other cities or where the owners of animals find markets for their specimens. The number of specimens during the year have diminished from the effect of a reduction of appropriation of funds and an order not to receive animals unless the owners agreed to furnish necessary food for them. There was an increase of visitors to the menagerie, which is accounted for by the great influx of strangers passing through the city, to and from Philadelphia, to visit the Centennial. The amount expended for the year was $15,418.10, against $18,089.92 of the previous year, being a reduction of $2,671.82.

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Recent American and Foreign Patents.

Notice to Patentees.

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NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED SMELTING FURNACE.

John L. Sturdy and John A. May, Goderich, Ontario, Canada.—This invention relates to the combination and arrangement of a cupola, two furnaces, and two steam boilers, discharging jets of steam into the combustion passages of the cupola for creating draft in a smelting furnace, whereby efficiency in operation is secured.

IMPROVED SHOE FOR SCAFFOLDINGS.

Henry Batt, Kentish Town, London, Eng., assignor to Leonard G. Tabraham, Boston, Mass.—In this invention a shoe or box is provided with hooks on the upper corners of its sides, and teeth forming an extension of the bottom, whereby the device is adapted for attachment to a joist or vertical timber, and to receive and support the end of a horizontal timber.

IMPROVED TRACTION WHEEL FOR LOCOMOTIVES.

Jean Larmanjat, Paris, France.—This invention relates to an improvement upon that form of traction wheel in which spring seated teeth are arranged to project radially from the wheel, which teeth secure a better hold, and at the same time yield to any obstruction that may present itself; and the improvement consists in the means for controlling the teeth, whereby they may be allowed to project to engage with a rock bar to increase the traction, or be withdrawn into the periphery of the wheel, as may be desired.

IMPROVED APPARATUS FOR PROPELLING CARS.

John B. Tibbits, Hoosick, N. Y.—This invention relates to apparatus for propelling street and railway cars by means of steam engines or other similar motors; and it consists of a frame suspended centrally from the car frame, and carrying two shafts, upon which friction wheels are secured. The supports for the said shafts are capable of both vertical and lateral motion.

IMPROVED CAR COUPLING.

Floyd Heavener, Laramie City, W. T.—This invention relates to an improved car coupling, adapted to couple automatically with cars of different heights of drawbars, and with cars having the ordinary form of link and pin coupling. The drawbar is enlarged at its front end, and provided with horizontal partitions which form a tier of vertical series of throats with tapering mouths, which are made of such depth and width as to receive the coupling link.

IMPROVED WINDWHEEL.

James P. Preston, Gold Run, Cal.—The advantages claimed for this windwheel are that it may be readily adjusted while running, it is acted upon by wind blowing from any direction, and as the vanes are curved so that their inner edges are nearly at right angles with the course of the wind, the action of the wind is positive, and the greatest amount of the power of the wind is realized; also that the wind has free and unobstructed discharge from the wheels.

IMPROVED COOLING APPARATUS FOR STAND PIPES OF GAS RETORTS.

David R. Shiras, Sharon, Pa.—This invention is to prevent the stand pipes of gas retorts from reaching a sufficiently high temperature to cause an accumulation of carbon or baked tarry matter in the stand pipes to enable the manufacturer to heat the retorts to the maximum temperature without causing a stoppage in the stand pipes, and thereby increase the production of gas, as well as improving its quality and greatly diminishing the time occupied distilling the charge. To the ordinary stand pipe, which conducts the gas from the mouth of the retort to the hydraulic main, is a curved pipe surrounding the same, which is perforated from the under side, so as to direct the number of jets of water against the stand pipe.

IMPROVED SCREWDRIVER.

Andrew J. Curtis, Monroe, Me., assignor to himself and Edmond H. Neally, of same place.—This invention consists of a screwdriver having a sliding sleeve, with spring jaws or tweezers extending over the end of the screwdriver, and being spread by a conical collar of the same back of the driving edge. When the pressure on the sleeve is removed the tweezers slide back and clasp the screw, so as to admit the ready insertion of screws into soft wood without requiring holes, or the taking hold of the same, and removing them when turning loosely in the worked-out screw holes.

IMPROVED STEAM BOILER AND SUPERHEATER.

Solomon N. Carvalho, New York city, assignor to himself and James M. Pattee, of same place.—The object of this invention is to economize fuel in the generation of steam, and to superheat the steam from the boiler in a separate and independent steam dome, so as to prevent priming, and permit pure dry steam only to go to the cylinder of the engine. It is intended to provide in the lower part of the boiler an enlarged heating surface that assists in and accelerates the generation of steam and the more perfect utilization of the fuel. A hollow water back or loose reservoir is placed in the combustion chamber of a boiler, and a water-conducting pipe that leaves the highest point of the water back at the side of the boiler, enters from the outside of the boiler into a separate steam dome, that is connected by a pipe and check valve with the main steam dome. A heating water pipe is arranged in the shape of a serpentine coil in a separate steam dome, and conducted then through the shell of the boiler. The steam in the steam dome is superheated and made drier, being brought by the pipe to greater pressure and elasticity than the steam in boiler, so as to be used with greater effect in the cylinders of the engine, to which the steam dome is connected by suitable pipes. From the superheater the pipe runs longitudinally through the boiler to the back of the same, then down along the boiler, and enters at the bottom or lowermost part, which is usually the coldest on account of the insufficient passage of the fire gases through the lower flues.

IMPROVED RELIEF APPARATUS FOR ROLLING MILLS.

Edward C. Hegeler and Frederick W. Matthiessen, La Salle, Ill.—The object of this invention is to prevent the breakage of rolls and roll gear by connecting the screws that regulate the distance between the rolls with rubber cushions, which permit the rolls to separate under extraordinary pressure, but do not yield under the usual working pressure.

IMPROVED DEVICE FOR TRANSMITTING MOTION.

Peter Derkum, Richmond, Ind.—This invention consists of a revolving shaft with double driving wheels, which are connected by a straight and cross belt with pulleys of separate shafts, transmitting the power from the same by friction disks with beveled edges to a conical pulley of a vertical revolving shaft, to which the moulding knives or other working devices are attached. The object is to provide a device for transmitting motion from a horizontal crank shaft to a vertical shaft, to be used for working moulding and other machines in which a steady and continuous motion is required.

IMPROVED FURNACE.

Henry C. Richmond, Allegheny City, Pa.—This invention is an improvement upon that form of furnace in which steam jets are employed to inject or carry in by induction atmospheric air to the combustion chamber to consume the smoke; and it consists mainly in the particular construction of an air and steam pipes having concentric nozzles arranged within the front part of the furnace, and combined with a fire tile for the pipes to protect them from excessive heat.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED SCHOOL DESK.

William Walgrain, Charles F. Buscall, and Kate Buscall, New York city.—This invention consists in a box for the reception of books, constructed so that the front shall be made to answer the purpose of a rest or easel when the box is placed in a vertical position.

IMPROVED STIRRUP.

Charles E. Wallin, Salt Lake City, Utah Territory.—This invention is designed to prevent the noise and chafing produced by the stirrup strap, to provide a degree of elasticity for the rider's foot, and to straighten and reinforce the stirrup against splitting. The improvements consist, first, in interposing between the upper ends of the stirrup a metal and a rubber roller, both of which encompass the pivot bolt to form a bearing for the strap; and secondly, in reinforcing the body of the stirrup by a peculiar arrangement of metallic straps or bands.

IMPROVED GRAIN STEAMER.

Edward C. Jones, Independence, Mo.—This invention relates to an improved device for steaming grain just before it is ground for the purpose of softening the cuticle, and thereby facilitating the removal of the bran. The improvements consist principally in the construction and arrangement of a deflector located in the casing, and adapted to scatter or spread the descending grain, and at the same time to spread and divert the steam through the grain in its descent. The invention also consists in the combination of said deflector with the steam and drain pipes and their valves, and with the chutes and their cut-off slides.

IMPROVED GROUND SQUIRREL EXTERMINATOR.

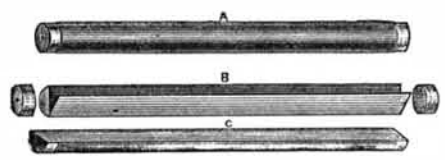
Henry Dreyer, Oakland, Texas.—In this apparatus a coal fire is started in a furnace and the end of a pipe is inserted in the hole leading to the nest of the gophers or ground squirrels, and the soil is packed around it. After the coal is fully kindled, sulphur is put in and a slide closed, so that the action of a fan blower will force the fumes through all the branch passages of the nest, and the whole colony of gophers will be destroyed in a few minutes.

IMPROVED POSTAGE OR REVENUE STAMP.

David G. Beaumont, Austin, Texas.—These stamps are made of two thicknesses of paper, the lower one, to which the mucilage is applied, and the upper one, upon which the stamps are printed. The upper paper has incisions cut in and across it, parallel with each other, and at suitable distances apart. This paper is then laid smoothly upon the lower paper, and the two are secured together with mucilage. The stamps are printed upon the paper thus prepared, and the paper is thus punctured between and around the stamps in the usual way. The upper paper may also have incisions formed in it through the body of the stamps, and at right angles with the main incisions.

IMPROVED COMBINED BLOTTER AND RULER.

Mark P. McElhinney, Montreal, Quebec, Canada, assignor to Robert W. Simpson, of same place.—This invention consists in an improved blotting



ruler formed of two semi-cylindrical strips with blotting paper B and C, wrapped around them. The flat surfaces of the two parts are then brought together, as at A, and rings or caps are slipped upon their ends, the slight elasticity of the blotting paper being sufficient to keep said caps securely in place.

IMPROVED HOG HANGER AND CARRIER.

Jacob Meyer, Hollowayville, Ill.—This invention is intended to furnish an improved device for carrying and hanging hogs in convenient manner; and it consists of a carrying frame with hinged braces, fixed legs, and a top round or crossbar, with suspension hook for the hogs.

IMPROVED SPOOL CASE.

Benjamin R. Hamilton, South Deerfield, Mass.—This invention has reference to a case for holding different sizes of spool cotton or silk thread, and paying it out as used without the inconvenience of the threads becoming entangled or being drawn back into the case by the rolling of the spools; and the invention consists of a spool case of any desired form or size, with hinged partitions between the spools and exit holes for the threads, provided with rubber, felt, or other binding substance that retains the thread.

IMPROVED PEN AND PENCIL CASE.

Richard M. Collard, New York city.—This invention consists in a pen and pencil case having both ends extensible, and both pen and pencil applied at one end, in combination with a double spirally grooved tube for moving the pencil stock, and an inclosing tube therefor, when this tube is fixed rigidly to the outer short case, and a short distance beyond one end.

IMPROVED BEER CASK.

John Hoffman, Toledo, O.—This improvement relates particularly to closing the ends of a metal tube extending from end to end of the cask, and fastened to the heads, for the purpose of facilitating cooling or warming the contents, by means of adjustable caps, pivoted to rings or boxes which are attached to the heads of the cask, and inclose the ends of the tube.

IMPROVED TOY PISTOL.

James Barry, New York city.—This invention is a toy to be used for exploding fulminate paper; and it consists of a tube having in it a side opening, and an anvil upon which the paper is laid, and a spring-acted plunger for striking the fulminate paper.

NEW HOUSEHOLD INVENTIONS.

IMPROVED COFFEEPOT.

Willis H. Sherwood, St. Joseph, Mo.—This invention consists essentially in the combination, with a water pot or receptacle, of a perforated steam pipe with detachable screw cap, for the purpose of using the coffeepot with steam; and secondly, of a funnel-shaped mouth of the filling tube closed by a cap with safety valve that may be opened at will to interrupt boiling by the thumb screw.

IMPROVED SASH FASTENER.

Frederick J. Hoyt, New York city.—This invention consists in the combination of a base plate, bent lever pawl, a rack plate, rod, and spiral spring with each other to adapt them to be applied to the sashes of a window; in the combination of a base plate, bent lever pawl, rack plate, screw rod, and nut for locking the pawl in place when engaged with the rack plate; and in the combination of a base plate, bent pawl, rack plate, screw rod, and nut for locking the pawl in place when withdrawn from the rack plate.

IMPROVED DISH WARMER.

James H. Wright, New York city.—This invention consists in a papier-maché block recessed upon the upper side, and lined with sheet metal to adapt it to receive and hold a heating iron. The case is divided into two compartments by a horizontal partition, with the papier-maché block or receiver that receives and holds the iron. The object of this invention is to furnish an improved device for keeping platters and other dishes warm when placed upon the table, and which shall be so constructed as to prevent the heat from injuring the table.

IMPROVED SAD IRON.

Thomas H. McCaffrey, Providence, R. I., assignor to himself, Henry J. Gorman, and William J. Armstrong, of same place.—This is a reversible sad iron, that is heated by gas, and used continuously by reversing the heated side from time to time.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED SASH FASTENER.

David T. Gerrish, Lewiston, Me.—This invention consists of a sash with countersunk recesses or sockets made square at the upper and rounded off at the lower side, so as to be supported on a spring-acted catch operated by a thumb piece projecting through a face plate of the window casing. The catch to work the upper sash is applied to a bolt that passes through a tubular bolt of the catch of the lower sash, the end of the inner bolt having also an operating thumb piece.

IMPROVED SASH BALANCE.

Adam Kolb and Charles Osberghaus, Sandusky, O.—This invention consists in a casing containing a serrated cam or pawl for clamping the cord and a lever for moving the cam for releasing the cord. When the cord is drawn downward through the casing the serrated cam binds it firmly at any desired point. When it is desired to release the cord it is drawn outward, so as to move the lever and by this means throw the cam upward out of engagement with the cord.

IMPROVED VEHICLE WHEEL.

Martin J. Racer, La Grange, Texas.—The object of this invention is to provide a vehicle wheel that is capable of being expanded so as to fit the tire, to obviate the necessity of removing, contracting, and replacing the tire.

IMPROVED FIFTH WHEEL.

Sanford P. Stillman, Westerly, R. I.—This invention consists of an axle and rocker having outer segmental guide rails and inner concentric rails or plates, the latter having toothed grooves and an intermediate spurred or toothed friction roller. The guide rails swing on a center bolt of the reach, while the rocker is steadily retained on the bed rails by a central connecting arm, bearing, by a notched part, on the flange of the inner rail or plate of the rocker.

NEW AGRICULTURAL INVENTIONS.

IMPROVED GATE.

Joseph T. Piggott and Albertus W. Hoyt, Newbern, Ill.—The object of this invention is to furnish an improved flood gate streams; and the invention consists in the combination of sill, posts, and crossbeam, gates, hinged trapdoors, stop hooks, latch hooks, catchers, and weights, ropes or chains, and swiveled pulleys. When the water rises, so as to have sufficient force to close the trapdoors, the hooks will be raised, and the gates allowed to swing open. As the water subsides the gates will be drawn shut by weights attached to the ends of ropes or chains.

IMPROVED CULTIVATOR.

James Sherrill, Harrisburg, Oregon.—The plow standard is pivoted between and at the ends of elastic bifurcations of the beam, and has a wedge-shaped projecting end beyond the pivot, the bifurcations converging from the top downward to hold the standard end. The plow beams have their forward ends bent sidewise into U form to receive a crossrod of the draw frame. The draw frame is formed of a crossrod, a curved bar, a crossbar, and parallel bars in combination with plow beams, clevis, and adjustable supporting bars.

IMPROVED MOWER AND REAPER KNIFE SHARPENER.

Zarda Frost, Kinmundy, Ill., assignor to himself and William H. White, of same place.—This invention consists in the combination in a grinding apparatus for mowing and reaper knives, of a centrally pivoted base plate, a swinging spring and treadle-acted frame, and a hinged vibrating and spring-cushioned supporting bar.

IMPROVED HARROW.

John W. Carpenter, Bridgewater, Va.—This harrow is so constructed that the teeth may be adjusted vertical, at a forward inclination, or at a rearward inclination, without stopping the team. To the inner side of the projecting ends of each side bar of the frame is attached a hook to receive the ends of the draw chain, to the center of which the draft is applied. This construction enables the draft to be changed from one side to the other, so that the wear may keep the teeth sharp. To the side bars of the frame are pivoted the ends of rollers, to which the teeth are attached.

IMPROVED STANCHION.

Zalmon W. Smith, Addison, N. Y.—This stanchion turns on central top and bottom pivots of a top crosspiece and the flooring, which pivots extend into socket holes of the top and bottom crosspieces of the stanchion. The lower crosspiece is supported on a lock iron or set screw, which projects into a groove of the lower pivot, which groove is not extended entirely around the circumference of the pivot, so as to admit only the turning of the stanchion into suitable inclination to either side, sufficient to admit of free side and up and down motion of the head of the cow.

IMPROVED PORTABLE CORN CRIB.

Benjamin F. Bedwell, Overton, Mo.—This crib is readily taken apart by drawing out hinge pins, disconnecting various stays and rods that hold it together, when it may be readily packed in small compass and transported from place to place. It may also be readily set up by first setting up the two ends and back, then placing the slatted doors and crossbar that is inside of the doors, erecting the posts, and connecting them by rods, putting on the middle rafter, the roof boards, and, last of all, the binding strips by which the roof boards are secured.

IMPROVED STUMP PLOW.

Washington Painter, Albion, Ill.—The object of this invention is to provide a stump plow that may be used in rough newly cleared timber land, that will readily cut the smaller roots, and will jump over or escape the larger roots. To the beam of the plow is attached a colter of peculiar form, which is held in position by a plate of rhomboidal form, having lugs, and is clamped to the beam by a bar and bolts. The plate is further secured to the beam by bolts, and by letting it into the side of the beam. The corners of the plate are disposed so as to offer the greatest resistance to the leverage of the colter.

IMPROVED DUMPING WAGON.

Charles S. Bateman, Battle Creek, Mich.—This invention is an improved dumping wagon, which is so constructed that it will dump itself when unfastened and started forward, and which may be made to discharge part or all the load at a time.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion. If the Notice exceeds four lines, One Dollar and a Half per line will be charged.

For Sale—Patent Office Reports Mechanical. R. D. Cooke, 18 New Church street, New York. Send stamp.

Best Pulleys and Couplings made; secured to shafts without keys, set-screws, bolts, or pins. Send for catalogue. Taper Sleeve Pulley Works, Erie, Pa.

Varnish Wanted—Perfectly protecting iron against wine and fruit juices, leaving no taste or odor, and to be readily applied inside of large iron tanks. Send prices and particulars to R. d'Heureuse, P. O. box 395, N. Y.

Wanted—Small Brown & Sharp Milling Machine, and small Lathe for making Taps. Address P. O Box 2132 New York.

Wanted—A chemist by a western chemical factory. Must be well posted in volumetric analysis. Address, with references, H. W. H., P. O. Box 875, New York city.

Wanted—To purchase a second-hand Disintegrating Mill. Please address, stating size and price, J. O. & E. Smith, So. Canterbury, Conn.

600 New and Second-hand Portable and Stationary Engines and Boilers, Saw Mills, Woodworking Machines, Grist Mills, Lathes, Planers, Machine Tools, Yachts and Yacht Engines, Water Wheels, Steam Pumps, etc., etc., fully described in our No. 12 list, with prices annexed. Send stamp for copy, stating fully just what is wanted. Forsaith & Co., Machine dealers, Manchester, N. H.

Reliable Oak Leather and Rubber Belting. A specialty of Belting for high speed and hard work. Charles W. Arny, Manufacturer, Phila., Pa. Send for price lists.

Shaw's Noise-Quieting Nozzles for Escape Pipes of Locomotives, Steamboats, etc. Quiets all the noise of high pressure escaping steam without any detriment whatever. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

"Abbe" Bolt, Forging Machines, and "Palmer" Power Hammers; best produced. Prices greatly reduced. Also sole builders Village and Town Combined Hand Fire Engines and Hose Carriages, $350. Send for circulars. Forsaith & Co., Manchester, N. H.

John T. Noye & Son, Buffalo, N. Y., are Manufacturers of Burr Mill Stones and Flour Mill Machinery of all kinds, and dealers in Dufour & Co.'s Bolting Cloth. Send for large illustrated catalogue.

Removal.—Fitch & Meserole, Manufacturers of Electrical Apparatus, and Bradley's Patent Naked Wire Helices, have removed to 49 Cortlandt St., N. Y. Experimental work.

Power & Foot Presses, Ferracute Co., Bridgeton, N. J.

For Best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay Sts., Brooklyn, N.Y.

Lead Pipe, Sheet Lead, Bar Lead, and Gas Pipe. Send for prices. Bailey, Farrell & Co., Pittsburgh, Pa.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing metals. E. Lyon & Co., 470 Grand St., N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Steel Castings from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Split-Pulleys and Split-Collars of same price, strength and appearance as Whole-Pulleys and Whole-Collars. Yocum & Son, Drinker st., below 147 North Second st., Philadelphia, Pa.

Skinner Portable Engine Improved, 2 1-2 to 10 H. P. Skinner & Wood, Erie, Pa.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

More than twelve thousand crank shafts made by Chester Steel Castings Co. now running; 8 years' constant use prove them stronger and more durable than wrought iron. See advertisement, page 110.

Emery Grinders, Emery Wheels, Best and Cheapest, Hardened surfaces planed or turned to order. Awarded Medal and Diploma by Centennial Commission. Address American Twist Drill Co., Woonsocket, R. I.

Reliable information given on all subjects relating to Mechanics, Hydraulics, Pneumatics, Steam Engines, and Boilers, by A. F. Nagle, M.E., Providence. R. I.

Notes & Queries

It has been our custom for thirty years past to devote a considerable space to the answering of questions by correspondents; so useful have these labors proved that the SCIENTIFIC AMERICAN office has become the factotum, or headquarters, to which everybody sends, who wants special information upon any particular subject. So large is the number of our correspondents, so wide the range of their inquiries, so desirous are we to meet their wants and supply correct information, that we are obliged to employ the constant assistance of a considerable staff of experienced writers, who have the requisite knowledge or access to the latest and best sources of information. For example, questions relating to steam engines, boilers, boats, locomotives, railways, etc., are considered and answered by a professional engineer of distinguished ability and extensive practical experience. Inquiries relating to electricity are answered by one of the most able and prominent practical electricians in this country. Astronomical queries by a practical astronomer. Chemical inquiries by one of our most eminent and experienced professors of chemistry; and so on through all the various departments. In this way we are enabled to answer the thousands of questions and furnish the large mass of information which these correspondence columns present. The large number of questions sent—they pour in upon us from all parts of the world—renders it impossible for us to publish all. The editor selects from the mass those that he thinks most likely to be of general interest to the readers of the SCIENTIFIC AMERICAN. These, with the replies, are printed; the remainder go into the waste basket. Many of the rejected questions are of a primitive or personal nature, which should be answered by mail; in fact, hundreds of correspondents desire a special reply by post, but very few of them are thoughtful enough to inclose so much as a postage stamp. We could in many cases send a brief reply by mail if the writer were to inclose a small fee, a dollar or more, according to the nature or importance of the case. When we cannot furnish the information, the money is promptly returned to the sender.

M. M. F. is informed that we could not recommend any steam engine or boiler as the most economical.—J. G. McC. is informed he can only ascertain the carrying capacity of his balloon by experiment. No rule for dimensions can be given. We know no manufacturer of the kind of balloon you refer to. See reply to C. E. L.

(1) C. L. asks: 1. Can salt or sea water be so filtered through a sand beach that a well dug from one to two hundred feet from the seashore will contain fresh water from the filtration of the sea? A. The salt cannot be removed from sea water by filtration. Land springs are sometimes struck close to the seashore, which leads to the delusion. 2. Can water containing coloring matter in solution be purified by filtration through sand or other material? A. The organic coloring matters in water are usually destroyed or removed, completely or in great part, by filtration through sandy soils, and contact with various rocks and minerals, but the complete purification of the water by these means depends much on the nature of the coloring matter and the degree of colorization. Granular animal charcoal readily deprives most liquids of organic coloring matters when they are allowed to filter slowly through it.

(2) W. H. C. asks if beef will keep fresh and sweet treated with acetate of soda? A. The process is an excellent one. See answer to W. E. S., on p. 43 present volume of the SCIENTIFIC AMERICAN.

(3) D. W. R. asks: What kind of potash is used in melting brass? A. Potash is not used to melt brass, but the carbonates of potash and soda are sometimes used as a flux.

(4) B. K. D. asks: 1. When sulphuric acid is used with manganese, to obtain its oxygen, what is the appearance or condition of the remainder? A. When separated from the undecomposed manganese dioxide in the flask, manganous sulphate is of a light pink or rose color. 2. Is there any other method of obtaining the oxygen from manganese than by mixing with sulphuric acid? If so, will you please inform me of the least expensive method? A. Oxygen may also be obtained from the oxide by strongly heating it in an iron retort in a good furnace. 3. Can you inform me how much sulphuric acid is required to free the oxygen from 10 lbs. manganese? A. For the complete decomposition of 10 lbs. of the pure dioxide, about 11·35 lbs. of sulphuric acid (specific gravity = 1·8) will be requisite, but it will be better to use an excess of the acid. These amounts will give you, if the action is completed, about 18 cubic feet of gas. 4. What are the other ingredients, or component parts of manganese, and what is the proportion? A. Manganese proper (Mn) is a metal, manganese dioxide, commonly called manganese, being a combination of that element with oxygen—($Mn O_2$). The proportions are: Manganese, 54·8; oxygen 32·0. With hot sulphuric acid the reaction is:

$$Mn O_2 + H_2 S O_4 = Mn SO_4 + H_2O + O$$

Manganic oxide. Sulphuric acid. Manganous sulphate. Water Oxygen.

(5) F. A. L. asks: Can you tell me how to remove ink stains from white marble? The ink is black French ink, and has been spilled on a white marble mantle. A. Try a strong aqueous solution of pyrophosphate of soda. If this fails, try a solution of a few drops of spirits of niter in a spoonful of water; apply with a feather, and wash well afterwards with water.

(6) I. H. E. says: Will you inform me how to melt and mould rubber? A. Rubber cannot be melted by heat without partial decomposition. The gum rubber (caoutchouc) may be softened by boiling water so as to admit of being worked or moulded as desired. After working, the rubber is caused to combine with a small per cent of sulphur, which vulcanizes it.

(7) A. K. S. says: Can you give me a recipe for making cement, one that will hold machine belts together? A. See SCIENTIFIC AMERICAN, p. 171, vol. 35. This composition is soluble in naphtha or benzole, and the addition of a little naphtha solution of caoutchouc is said to improve it.

(8) R. L. asks how red mottled soap is made? A. The mottled appearance is produced by the addition of a small quantity of an iron salt—usually copperas.

(9) J. H. C. asks: How can a strong solution of laundry starch and water be clarified, and the starchy taste removed, without destroying its gelatinous properties? A. If we understand you, this may be accomplished by boiling the starch for half an hour with a slight excess of water, and straining the paste while hot. If starch is boiled for some time with dilute sulphuric acid, it is converted first into gum (dextrin) and then into grape sugar, which may be separated from the acid by precipitating the latter with chalk.

(10) W. M. asks for a cement that will unite parchment paper, and will stand hot and cold water and not lose any of its adhesive properties? A. Mix ordinary glue with about 3 per cent of potassium or ammonium dichromate in the dark. This may be used on the paper, and after exposure to light becomes perfectly insoluble in boiling water. This glue has been very largely used in Germany for joining the parchment paper envelopes of pea sausages. The strips of paper joined by this glue are dried quickly and exposed to light till the glue changes to a brownish color; they are then boiled with water containing about 3 per cent of alum till all the excess of alkaline dichromate is extracted, and then washed in water and dried.

(11) J. B. & Co. ask: Is there any way that the aniline colors red and blue can be mixed with varnish for japanning metal, or with oil to be used as paint? A. Many of the clear varnishes and oils may be colored directly with some of the aniline dyes by mixing the coloring material with the solvent used. These dyes do not hold their colors very well at high temperatures.

(12) F. W. H. A. says: I cut down some trees in my garden last year, and wishing to get rid of the stumps without digging up the ground, I followed your recommendation, by boring holes 12 inches deep in them, pouring in about a pint of sulphuric acid, and plugging. This was done both in fall and spring, but, notwithstanding, shoots are coming up from the roots (and stems a little below the surface) of all the trees. Can you suggest a cause and a remedy? The trees are (or were) fig, lilac and elder, and they seem to care as little for the sulphuric acid as "Dan'l" did for "them ere lions." A. The sulphuric acid treatment referred to was recommended by one of our agricultural contemporaries presumably well informed in the matter. We had not tried the experiment, but it would seem reasonable to suppose that if a sufficient quantity of the acid were used in the proper manner, it might effectually destroy the vitality of the roots. To our knowledge the surest method of getting rid of stumps is by mechanical means, for which purpose there are a number of excellent devices in the market. It has been stated that the following method has been used with good success. In the top of the stump a number of holes, each capable of holding a pound or two of saltpeter (potassic nitrate) are bored, filled with the salt, and during the latter part of the fall kept full of water, which will dissolve the salt, and the solution formed gradually passes into the roots. In the early spring the same holes are to be filled for a week or two with kerosene oil, and finally the oil-soaked stump set fire to, when the combustion will proceed, aided by the oxygen of the niter, until the greater part of the roots are consumed, after the manner of a slow match. How far this may be matter of fact we are unable to say, but the experiment is perhaps worth trying.

(13) J. P. T. asks for a recipe for white metal that will melt at a low heat? A. An alloy of bismuth 8 parts, lead 5 parts, tin 3 parts, will melt below 212° Fah. Bismuth 2 parts, lead 5 parts, tin 3 parts, is said to melt in boiling water. Lead 3 parts, tin 2 parts, bismuth 5 parts, melts at 197°.

(14) H. E. asks for a recipe for manufacturing a good article of paste shoe-blacking at a moderate cost? A. Consult "Cooley's Cyclopedia of Practical Recipes," published by Lindsay and Blakiston, Philadelphia. You can judge of cost by consulting dealers in the articles you require.

(15) F. N. B. asks: 1. How can I black the inside of a tin telescope tube so that it will not rub off or retain dust? A. Thin shellac varnish and lampblack will do. It must be a dull, dead black surface. 2. How tight should a 2½ inch achromatic object glass fit in a tin cell? A. Not so tight as to bend or break the lens.

(16) W. B. asks for a cheap method of galvanizing iron? A. The iron is first cleaned bright by being kept for a time in sulphuric acid, then dipped in muriate of zinc, and then plunged in a bath of molten zinc.

(17) E. K. says: Can you give me the name of parties publishing a directory that gives the address of all the foundrymen in the United States and Canada? A. We know of no such directory.

(18) E. A. and others, who ask about carbolic soap: Take freshly prepared cocoanut oil soap 150 parts, and fuse; then add a solution of alcohol 10 parts, carbolic acid 6 parts, caustic potassa 2 parts, oil of lemon 1 part. Mix with stirring, and pour into moulds.

(19) W. E. asks: Will you please give me the mode of preparing the peroxide of hydrogen? A. It is prepared by decomposing the peroxide of barium with as much very cold solution of hydrofluoric or phosphoric acid as will exactly saturate the base. The baryta salt then precipitates, leaving the hydrogen peroxide dissolved in the water. The filtered solution is then concentrated in vacuo by the aid of the absorbing power of strong sulphuric acid in an adjoining connected vessel.

(20) F. S. T. asks: What is the best method for cleansing kid gloves? A. Put them together with a sufficient quantity of pure benzine in a large stoppered vessel, and shake the whole occasionally with alternate rest. If on removing the gloves there remain any spots, rub them out with a soft cloth moistened with ether or benzole. Dry the gloves by exposure to the air, and then place smoothly between glass plates at the temperature of boiling water until the last traces of benzine are expelled. They may then be folded and pressed between paper with a warm iron. Another way is to use a strong solution of pure soap in hot milk beaten up with the yolk of one egg to a pint of the solution. Put the glove on the hand and rub it gently with the paste, to which a little ether may be added, then carefully lay by to dry. White gloves are not discolored by this treatment, and the leather will be made thereby clean and soft as when new.

(21) P. J. K. asks: Is there any way of drilling a small hole in glass? I wish to suspend a pane of glass by means of a thread or fine string. I have broken a large amount of glass in trying to bore a small hole in it, but have not succeeded. A. Use turpentine, and take care when the drill is about to break its way through the glass as the hole is finished.

(22) E. C. H. says: You answer that my difficulty in pouring Babbitt metal boxes is in the vent; this is not the case, as I have left one side of the box entirely open, and then I failed to get the box solid, the metal seeming to chill too quickly. A. Try heating the shaft and boxes, and give good ventilation.

Are the wrinkles or ridges that are rolled in tinware intended to beautify or make more firm the vessel, or are both these objects intended? A. The principal use is to strengthen the vessels; although sometimes ornamentation is only desired.

Is an oscillating engine properly constructed as good as one with guides, connecting rod, etc., for all purposes? A. One great defect is that there is more wear in the parts of the oscillating, as usually made, than in the reciprocating. Where flat surfaces work upon each other with circular strokes, trouble is experienced in keeping them to wear equally, and consequently to keep them packed steamtight.

Can the edge of a razor, whetted to the keenest edge, be magnified? A. We presume it could be magnified.

(23) J. M. says: I have several small pieces of walnut ¼ inch in thickness, which have become warped. How can I make them recover and retain their proper shape? A. Steam them so as to soften them, then fasten them in the position which you wish them to retain.

(24) H. B. P. asks: Can you inform me whether you published during the Centennial any account of the Vienna model bakery and their processes? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 60, p. 953.

(25) E. L. M. says: A friend claims it will take no stronger dam to hold a pond of 100 acres, 10 feet deep, than one of 1 acre, 10 feet deep. I claim that the larger the pond the greater the pressure, but it presses in all directions and the dam has a pressure on it, more or less, according to its length, supposing it to be the same depth in every place in both cases. A. Your friend is right, you are wrong.

He claims that gold sinks in quicksilver because the silver adheres to it. I say it is because the gold is heaviest. A. You are right.

(26) H. W. asks: 1. What kind of wheel and stone does the scissor and razor grinder use? A. Any free cutting grindstone will answer. The diameter from 4 to 12 inches is generally used, and from 2 to 4 inches thick. 2. What kind of an oilstone to finish the razors? A. You can obtain suitable oilstones from dealers. 3. The name of a good book for the amateur machinist and jobber? A. Address H. C. Baird & Co., 810 Walnut street, Philadelphia, Pa.

(27) B. A. W. asks how to make shellac varnish? A. Take shellac, any quantity, put it in a glass jar or tin vessel, and add alcohol to just cover the shellac. Set in a warm place, beside a stove or even in the sunshine, and in two or three days it is fit for use. If too thick add alcohol. It is not necessary to strain, as impurities will settle to the bottom of the vessel. Keep covered to keep out dust. If closely corked, evaporation of the alcohol will be very small. It can be used for wood, brass, iron, paper, etc. Experience will determine the proper thickness of the varnish.

(28) I. F. B. asks how to make straw board impervious to water? A. Try soaking in linseed oil and then cover with repeated coats of varnish.

(29) W. E. B. A. Co. say: Can you tell us how to cut off iron rods in a more economical way than by means of a cold chisel and filing to length? A. If you have an engine lathe in your factory, run a circular saw, at a proper speed, between centers, arrange some method to hold the rods in the tool post, and cut them to gauge the proper length.

(30) H. C. McG. asks: Which way is the torpedo most destructive? Does it blow the vessel out of the water, burst it in pieces, or blow holes in the bottom? A. The torpedo, upon being exploded in contact with the side of the vessel, is intended to burst a hole in the hull and thus sink her.

(31) G. E. S. asks: How are glass water gauges cut off to proper lengths without breaking? A. One method employed by mechanics is to break off the end of a round file, say ¼ inch, so as to obtain a sharp edge, then with it scratch a circle on the inside of the gauge, at the proper length, and it will readily snap off where the scratch is made.

(32) V. A. S. asks for a recipe for making tooth paste? A. Take sugar of milk 100 parts, pure tannin 15 parts, lake 10 parts, oils of mint, aniseed, and orange flowers, sufficient quantity. Rub together the lake and tannin, gradually add the sugar of milk, and then the oils.

(33) H. G. H. asks for a recipe for making boot blacking. A. Ivory black 1 part, molasses ½ part, sweet oil ⅛ part. Mix and stir in hydrochloric acid ⅛ part, and oil of vitriol ¼ part. Dilute the acid with twice its weight of water before mixing. Another recipe is to take ivory black 4 lbs., molasses 2 lbs., sweet oil 1 lb., oil of vitriol 8 lbs. Mix and put in boxes.

(34) E. R.—The material of which you ask information is chloride of silver, and when found native is called horn silver. It is procured as a dense white flocculent precipitate on adding hydrochloric acid or the solution of any chloride to a soluble salt of silver.

(35) G. W.—The disease and remedy may depend much on the physiological condition of the individual. Apply to your family physician.

(36) F. W. F. says: Send me instructions for the building of a cheap single scull shell to be made of canvas. Length about 18 feet. A. See Nos. 25, 26, 29, 30, 32, 36, 37, 39, and 42 of the SCIENTIFIC AMERICAN SUPPLEMENT, which give illustrations, descriptions, and proportions of boats. As your query is very indefinite, we can give no exact rules for your guidance. We presume a perusal of the papers referred to will give suitable instruction.

(37) D. H. asks: How is citric acid manufactured? What machinery is required to operate a factory on a small scale? A. Citric acid is generally manufactured from lemon juice, which is imported in a concentrated state, produced by evaporation by a gentle heat. It consists of citric acid 6 to 7 per cent, alcohol 5 to 6, and the remainder water, inorganic salts, etc. By some manufacturers it is allowed to partially ferment for the purpose of evaporating the clear liquor from the mucilage, or it may be clarified in the usual method by the use of albumen in the form of the white of an egg. Carbonate of lime in fine powder is then gradually added, and stirred in so long as effervescence continues. Citrate of lime forms, and after being separated by drawing off the watery liquor is well washed with warm water. It is then intimately mixed with strong sulphuric acid diluted with 6 parts of water. After some hours the citrate is decomposed, the sulphuric acid having taken up the lime and formed an insoluble sulphate, setting the citric acid free. This, separated by decanting and filtering, is evaporated in leaden pans till it attains the specific gravity 1·13. The evaporation is afterward continued by a water or steam bath till the liquor begins to be syrupy, or to be covered with a thin pellicle. It is then removed from the fire, and put aside to crystalize, the mother liquor after a few days be-

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ing evaporated as above, and again set to crystalize, and so on as long as clear crystals are obtained. To obtain pure citric acid, all the crystals should be redissolved and recrystalized, it may be several times, and the solution digested with bone black. A gallon of lemon juice should make about eight ounces of crystals. Limes and lemons constitute the source from which citric acid is generally made, yet it may be extracted from oranges, currants, gooseberries, raspberries, tamarinds, etc. The machinery and cost of manufacture will depend upon circumstances which any one about to go into the business can best judge.

(38) D. B. K.—Your inquiry was answered last week. To clean moss from trees, wash them with lye made by leaching wood ashes. To clean marble, wash with quicklime, clean, rub with fine putty powder and olive oil.

(39) Constant Reader is informed that there are many works on steam boilers and their management. He had better select those he considers best adapted to his wants.

(40) W. F. B. asks for a book that describes the locomotive. He had better procure Forney's "Catechism of the Locomotive."

(41) R. S. N. asks how to thin down printers' ink which will answer to print stencils made by a sharp needle, such, for instance, as the stencils made by an electric pen? A. You can thin ordinary printing ink with linseed oil or with kerosene.

(42) G. A. S. asks: How much water is contained in 1 cubic foot of steam at 30 lbs. pressure? A. Weight of a cubic foot of steam, at 30 lbs. pressure by gauge, about 0·1079 lbs.

(43) M. M. McP. asks: Can a dirt road engine be made to run in our Texas land successfully? If you know of any, please give me the address. A. Insert a notice in our "Business and Personal" column, which is especially designed for such inquiries.

(44) I. T. W. says: I am making an engine, the cylinder being 2½ inches in diameter, and 5 inches long. I have a smaller one ⅛ inch diameter and 5 inches long. I have a larger one 4 inches in diameter and 7 inches long. Please let me know what horse power each engine will be, and what sized boilers will be required? A. See pp. 33, 225, vol. 33.

(45) W. B. B. says: Suppose two rifles are so charged that they will send their bullets exactly the same distance, all things being equal, which of the two would send its ball to a given point the quickest, if one man remains stationary and the other man fires from a rail car going at the rate of 60 miles an hour, both rifles fired simultaneously and of course at an equal distance from the mark, and fired in the direction the rail car is travelling? A. The one on the car.

(46) I. T. C. says: I am running an 11 x 20 inch stationary engine, with one 40 inch two flue boiler 14 feet long. The boiler is good but not large enough for the engine. I have a good 14 inch flue. If I connect it to my boiler lengthways on top, and use it as a steam drum, would it not add considerably to my boiler power? A. As we understand the proposed mode of connection, we do not think it would increase the steaming capacity of the boiler.

(47) A. M. H. asks: Can I use an engine as large as 60 inches in diameter and 12 feet stroke, and condense the steam with an inside condenser of Lighthall's or some other good make, and whether I can make as much vacuum as I could form with a jet, also if a jet condenser works well with water that is muddy like our western rivers? A. Generally, surface condensers do not make quite as good a vacuum as jet condensers. If the water is very muddy, there might be some trouble in keeping the plunger of the air pump tight.

(48) L. E. N. asks: Would water, if deep enough, be so compressed that an iron ball would cease to sink? A. No. See p. 208, vol. 33.

(49) H. M. W. asks: 1. Why is the moon said to be viewed at an angle of ⅛ degree? A. On account of refraction.

Please give me the names of the metals as regards their expansibility with heat, heading with the most expansible? A. The principal metals are arranged, in the order of expansibility, as follows; Platinum, palladium, tempered steel, antimony, iron, bismuth, gold, copper, brass, silver, tin, lead, zinc.

Would a peg driven horizontally in an upright post at the equator, throw the same length shadow at noon as at 6 o'clock A.M. and P.M.? A. Yes.

What would be the relative time of the passing of a railroad train a point, say the edge of a building situated 300 feet from the point of observation, the train being a mile away, and that point being any other distance? A. Please send a sketch, to make your meaning plainer.

(50) D. F. H. says: M. says that the proper way to set carriage axles is to set them forward. I claim that an axle to run easy should be set straight, so there will be no friction against nut or washer. Who is right? A. You have the right idea, as we understand your question.

(51) B. says: In an argument with a friend on the subject of "Revolutions of a Wheel," he claims that the hub goes faster than the rim or outward part of the wheel, on the ground that the hub receives the first of the power of motion. On the other hand, I claim that there is no distinction, that when one part moves or receives motion, the whole does. A. It is a question of terms. As the outer portion of the wheel makes as many revolutions as the hub, it necessarily goes through a greater distance in a given time.

(52) A. Y. asks: What is meant by a circular inch? Is it 1 inch in diameter? Why divide by the decimal 0·7854 to get the area? How is this decimal got? What is the area of a valve that is 2 inches square? A. You should consult some elementary work on geometry.

(53) Southern Subscriber asks: What must tobacco leaf be sprinkled with before being cut, and what process is necessary, after cut, to obtain a good acceptable flavor? A. The flavoring ingredients are a matter of taste. Molasses, glycerin, cascarilla bark, and anise seed are some of the materials employed.

(54) W. H. C. says: Can you tell me what will kill weeds, such as plantain, that grow around a well where it is wet and marshy? A. Perhaps the best plan would be to drain the land around the well, and fill in with stones or cement.

(55) I. W. W. asks: What pressure or resistance does mercury offer at 100°, 200°, or 300°, etc., per square inch? A. The pressure of the mercury vapor at the different temperatures is approximately as follows; 100°, 0·0015; 200°, 0·0114; 300°, 0·08 lbs. per square inch.

(56) R. H. McN. says: R. B. G. asks what the pressure against the collar of a horse is, traveling at the rate of 3 miles an hour, to raise 33,000 lbs. a foot high per minute? (I should have said pulling at the end of a lever.) It makes no difference what lever he pulls at, as the rate of travel is given, and the amount of resistance. The rate of speed is 3 miles per hour = 15,840 feet, to raise 33,000 lbs. at the rate of 1 foot per minute = 1,980,000 foot lbs. per hour, which if divided by 15,840 feet (the speed of the horse) gives 125 lbs. of resistance or pressure against the collar. A. We accept the correction with thanks.

J. Y. says: "If all the measures, length, surface, and capacity in the world, and all the weights, were lost, by what means could new ones be obtained to correspond exactly with those we now have?" The standard yard of the State of New York is a brass rod, which bears to a pendulum beating seconds in vacuo, in Columbia College, the relation of 1,000,000 to 1,086,141 at a temperature of 32° Fah. One third of a yard square of pure water at 60° Fah. weighs 62½ lbs. We could therefore get our weights and measures perfectly. A. The restoration of the British standard of length, that is, the reproduction of the one that was burnt, was found to be impossible. Scientific men generally agree that, if a standard and all copies of it are lost, it cannot be exactly reproduced. The weight of a definite volume of pure water has never been exactly determined, that is, the weights used as standards by different nations, when referred to water, do not exactly agree.

(57) S. R. H. asks: What can I use for filling for walnut before using shellac? A. Almost any cheap varnish will do. Scrape clean and thoroughly dry. The object is to fill the pores of the wood.

(58) J. W. G. asks for a solder to solder backs to stereotypes. A. Use common plumber's solder, and apply muriate of zinc as a flux.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

A. R. McC.—It appears to be calamine—silicate of zinc.—W. A. N.—No. 1 is a limestone. No. 2 is clay slate. No. 3 is bitumen mixed with clay and sand. If distilled in a close retort it will yield rich illuminating gas and various oils. It may be used also as a fuel. No. 4 is crystalized carbonate of lime—calcite.—G. S. M.—It is pyrites. See p. 7, vol. 36.—K. R. F.—It contains iron, lime, magnesia, and silica—it is called augite.—Package marked Newburyport contains a piece of cinder and a small fragment of mica schist.—W. W. —No. 1 does not contain copper. No. 2 is jamesonite—sulphide of antimony and lead. No. 3 is crystalized lime carbonate. No. 4 is quartz crystals. No. 5 contains only a trace of lead and no silver. No. 6 contains bismuth sulphide—bismuthine, also copper. No. 7.—Neither rock nor flux contains silver—the bright specks are mica. No. 8.—The rock may contain silver; the sample does not. No. 9. The metal-like particles in the rock are iron pyrites. No. 10 is gray ore of antimony. —G. N.—There seems to be no patent on rose-leaf beads —the ones sent were nearly inodorous after a week.—F. A. D.—Please send more of the ore.—I. R. B.—The fragment contains fluorspar.—The contents of paper box marked F. G. seem to be a mixture of chalk and magnesia, with flour and other organic matters.—J. M. F.—It is a variety of bituminous coal, yielding considerable ash. You should have sent a specimen of more recent mining.—D. J. M.—It is an impure clay. It might be used for brick making, pottery, and similar purposes.—I. W. D.—It is arragonite—a pure lime carbonate. If in large quantities it might be used as a source of carbonic acid and lime.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On a Safe Filling. By C. W.
On the Telegraph. By T. G. G.
On a Mathematical Problem. By R. A.
On Solutions of Indeterminate Problems. By H. M.
On the Questions of Bacterial Origin. By S. L. N. F.
On the Great Strike, etc. By I. S. C.
On a Mechanic's Incog. By W. P. T.

Also inquiries and answers from the following:

W. A. D.—B. J. H.—G. W.—G. W. P.—J. S. A. B.

HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who publishes books on bricklayers, etc.? Who publishes books suitable for amateur mechanics? Who makes a small, good, portable steam engine? Where can spring levels be obtained? Who makes and sells egg incubators?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

July 10, 1877,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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DESIGNS PATENTED.

10,091.—CASSIMERES.—O. F. Chase, Thompson, Conn.
10,092.—PARLOR TABLES.—P. P. Kuehborth, Buffalo, N. Y.
10,093.—CUFF.—E. A. Litchfield, Somerville, Mass.
10,094.—CLOCK CASES.—H. J. Muller, New York city.

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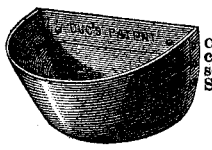

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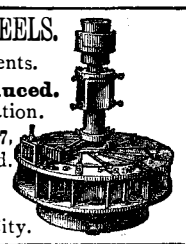

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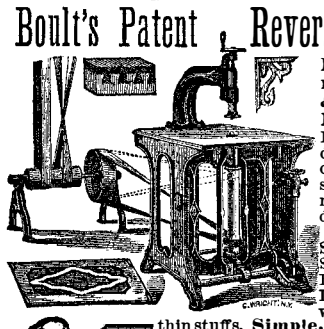

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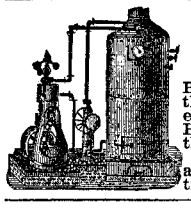

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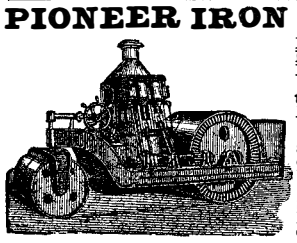

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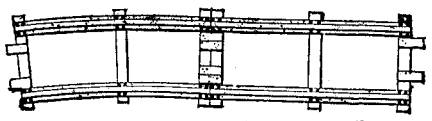

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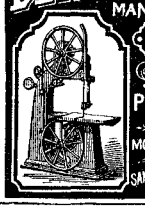

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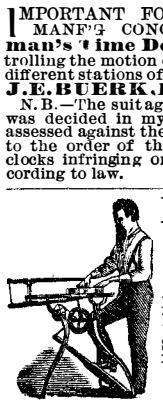

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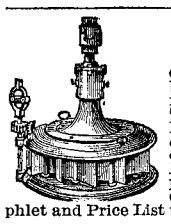

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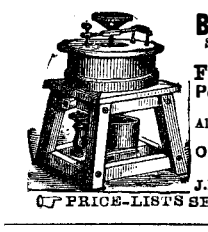

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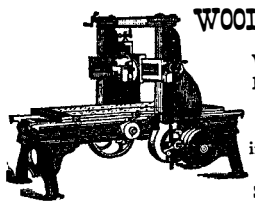

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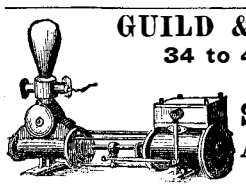

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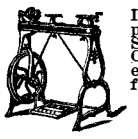

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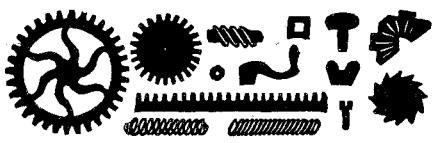

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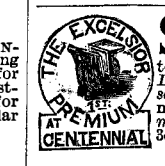

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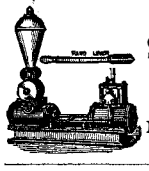

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